

PROGRESSIVE  
MEDICINE







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1915

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*Awarded Grand Prize, Paris Exposition, 1900*

# PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES  
AND IMPROVEMENTS

IN THE  
MEDICAL AND SURGICAL SCIENCES

EDITED BY  
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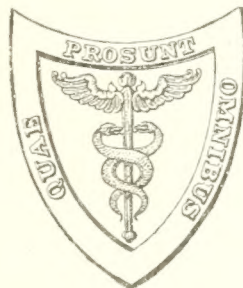
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VOLUME II. JUNE, 1915

HERNIA—SURGERY OF THE ABDOMEN, EXCLUSIVE OF HERNIA—GYNECOLOGY—  
DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES.  
DISEASES OF THE SPLEEN, THYROID GLAND, NUTRITION,  
AND THE LYMPHATIC SYSTEM—OPHTHALMOLOGY.



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# PROGRESSIVE MEDICINE.

JUNE, 1915.

## HERNIA.

By WILLIAM B. COLEY, M.D.

**The Treatment of Hernia in Infancy and Childhood.** Sir Victor Horsley,<sup>1</sup> in his Sir William Mitchell Banks Memorial Lecture, makes a very strong plea for a wider application of surgical methods in the treatment of hernia. He states "the one grave fact which stands out clearly is that our present treatment of such a very common and simple condition as hernia is exceedingly faulty and urgently needs a reconsideration, because a very large number of our fellow citizens are clearly not protected from its false consequences. But there is also an equally important socio-economic reason for condemning our present methods of dealing with hernia and that is the continual loss of national working efficiency, owing to the personal incapacity caused by hernia to the hardest worked and most industrious classes of the community."

He refers to the recent statistical report to the Local Government Board by Dr. Basil Cook, which gives tables constructed from the examination of recruits and which he believes at least constitute a rough basis for a minimal estimate. He states, "from these figures we are probably justified in assuming that at any given moment 500,000 individuals of all ages are suffering to a greater or less degree from hernia in the United Kingdom. As regards total incapacity leading to social failure and poverty, Dr. Basil Cook found that, out of 3162 paupers, nearly 2 per cent. attributed their pauperism to their being rendered incapable by a hernia."

In explaining the reason why the medical profession has failed to protect the community from such loss, he states that "we have drifted into the unfortunate habit of regarding a truss as the treatment of hernia" and this because we follow the path of least resistance. He believes that the only procedure deserving the name of treatment of hernia, is the operation for its radical cure. He believes that our present

<sup>1</sup> British Medical Journal, October 17, 1914, p. 657.



methods of truss treatment should be rightly characterized as maltreatment of hernia, and might be compared with the older and inefficient methods of operation for cancer of the breast. He states that in pre-antiseptic times the opposition to operative treatment of hernia was based upon very sound objections, *viz.*, the high mortality of the operation and the very large number of recurrences, but in spite of the fact that Lister's work is now forty-five years old, such is the unfortunate conservative influence of tradition and custom, that there still exists a certain prejudice against the radical operation, and some surgeons in consequence will speak of "treating" hernia (even in the adult) with a truss, as though this mechanical placebo was something more than a makeshift.

"In fact, a truss, like treatment by taxis of a strangulated hernia, is one of those *reliquiæ diluvianæ* which will still survive in medical practice, to the detriment of the community and suffering public, until the only rational treatment by radical cure has become so habituated that operation will immediately follow diagnosis."

Horsley takes strong issue with the opinion that in young children the operation is comparatively rarely required, for the reason that during the first few years of life herniæ show a great tendency to undergo spontaneous cure.

Horsley states that he knows of no statistics which justify the use of the word "cure" as here given. He fully agrees with the opinion of Hamilton Russell, that the chief etiological factor in hernia is the presence of a preformed sac. This is the view that I have held for many years and which I have expressed in previous articles of PROGRESSIVE MEDICINE.

While I believe the profession is greatly indebted to Horsley for emphasizing the need of further extension of radical operation for the treatment of hernia, I think he has gone a trifle too far in advocating immediate operation in all cases of infants and young children as soon as discovered. He states that these cases of so-called cures are never followed up.

In this connection I would call attention to an attempt which I made a number of years ago, at the Hospital for Ruptured and Crippled, in which I traced the after-history of 15,000 cases of hernia, treated by truss, in young children and infants, in an endeavor to ascertain how large a proportion were free from recurrence when the patients had reached adult life. This study is not only very difficult, but not entirely satisfactory. Yet, from the data obtained, I feel justified in concluding that in a considerable number of cases, probably 50 per cent., the hernia was actually cured. That does not mean that the preformed pouch or hernial sac of congenital origin was closed by firm adhesions. I believe that such sac probably remains more or less patent during the life of the individual; on the other hand,



it may be so small in size, and so well protected by well-developed abdominal muscles, as never to permit the recurrence of the hernia or cause any danger or discomfort to the patient.

The danger of strangulation in infants and young children is extremely small, as I have already pointed out, and, even if it does occur, the risk from operation is comparatively slight. We have had twenty-five operations of strangulated hernia in children under two years of age at the Hospital for Ruptured and Crippled, without a death. Children suffering from hernia, over the age of four years and all adults, except in the presence of important contra-indications to operation, I agree with Horsley, should be treated by operation and not by trusses.

In regard to the best type of operation for the radical cure of hernia, Horsley calls attention to Mitchell Banks' share in the development of the modern operations for this purpose. The two principles which he advocated, namely, removal of the sac with restoration of the continuous peritoneal surface (*i. e.*, abolition of the fossa), and protection of the hernial area by closure of the inguinal or femoral canal, are the foundation of the best methods of today.

In regard to THE OPERATION FOR FEMORAL HERNIA, Horsley states: "The anatomical conditions of inguinal hernia secure that with the closure of the neck sac there is also an abolition of any infundibular fossa, but this is not the case with femoral hernia, and I believe that some unfavorable criticism of radical cure of hernia in general has resulted in consequence of the operative treatment of femoral hernia failing to completely satisfy Mitchell Banks' first principle, namely, complete abolition of the sac. All present day operations for the radical cure of femoral hernia which approach the sac from below and include various steps, such as closure flaps of aponeurotic tissue, like the pectineal fascia, etc., are liable to failure, though a certain number succeed."

"They should, in my opinion, be wholly abandoned in favor of the method of operating from above, which I employed from about 1890 at University College Hospital. It consists, first, in a 3-inch horizontal incision through the abdominal wall just above the inguinal canal, ample room being obtained by firm retraction, especially of the rectus inward. The peritoneum being exposed, traction is made upon it and the femoral hernial protrusion lifted out of its bed intact. The sac is then completely removed and the continuity of the peritoneum made normal. The upper orifice of the crural canal is then closed, preferably by a flap of periosteum and a thin scale of bone from the posterior surface of the pubic bone."

He suggests that, "recurrence is impossible by this method of operating and that it involves no more special procedures than those of approach from below, but that its chief value lies in its complete fulfillment of Mitchell Banks' principles."



The method Horsley recommends for femoral hernia, is the operation by the inguinal route, similar to that described by Lotheisen and Gordon, and later strongly advocated by Moscovitz in this country.

Nearly every year I have had occasion to review some of the various methods advocated for femoral hernia by the inguinal route. I have been unwilling to accept such methods as an advance in the operative treatment of femoral hernia for two reasons: (1) they substitute a much more difficult for a simpler technique, and (2) they have not thus far shown results superior to those obtained by the simpler methods of high ligation of the sac with purse-string suture of the femoral canal.

By this method we have operated upon 203 cases at the Hospital for Ruptured and Crippled, with 6 relapses, and I have operated upon more than 100 cases in other additional hospitals with no relapses.

MacLennan,<sup>1</sup> of Stirling and Glasgow, describes a SIMPLIFIED OPERATION FOR THE CURE OF HERNIA IN INFANTS and makes a strong plea for extending radical operation for hernia to infants.

The operation itself does not differ very greatly from that proposed some years ago by Dr. Lorthior, of Brussels, and performed in a very large number of cases.

The most striking feature in MacLennan's article is his strong advocacy of the wholesale radical treatment of hernias in infants in the out-patient department of a hospital. He states that the credit for the initiative of doing hernias in out-patients belongs to Dr. Jas. H. Nicoll, and that the method which he (MacLennan) performs is so simple, that the dangers associated with radical operation have vanished. The cases that are selected are infants not over two years, in fair general health, with mothers of average intelligence, able and willing to give a little more attention than usual to the child. Food is withheld for three hours prior to operation, but the bowels are not interfered with. The groin is washed with soap and water while the anesthetic (chloroform) is given. This is followed by a copious lavage with alcohol after which the area is covered with sterile gauze. An incision, not over  $\frac{3}{4}$  inch in length, is made over the internal ring. The sac and cord are found and picked up with pressure forceps and drawn out of the wound. The sac is separated from the cord and treated as in Macewen's operation. No. 1 iodized catgut is employed. The suture for puckering the sac is also used for the closure of the deep wound. MacLennan states that in older children with well-distended canals and large herniae, careful suturing of the canal should be carried out as in adults. The superficial wound is closed with one or two silk-worm sutures and dressed by a roll of gauze made to cover little more than the wound and held in position by a piece of adhesive plaster 3 x 2 inches in size. He believes that elaborate dressings are quite unnecessary and only annoy the infant.

<sup>1</sup> Medical Press and Circular, April 8, 1914, p. 357.



At the end of a week the child is brought back to the dispensary to have the stitches removed, and a little powder put upon the parts. What happens during this interval between the operation and first dressing is not inquired into.

In regard to the results of this operation, MacLennan states it is proverbially difficult to trace hospital cases, but, of those seen, only one showed a recurrence. One or two showed some general disturbance from hemorrhage distending the scrotum; one died three weeks after operation of meningitis.

Unfortunately, the number of cases treated by this operation is not given, nor the time of observation after operation.

MacLennan states that the radical cure of hernia in the adult possesses serious morbidity and some mortality, while the operation in infants possesses practically neither.

With this statement I cannot agree. Our statistics at the Hospital for Ruptured and Crippled, which appear elsewhere in this article, give some idea of the general morbidity and mortality in adults or in cases beyond the age of four years. Including cases outside of the Hospital for Ruptured and Crippled, I have operated upon one series of 1000 cases without a death. Harold Stile's statistics of operations upon infants and very young children performed under much more ideal conditions as regards the operation itself, as well as the after-treatment, as they were all indoor-patients and not out-patients, showed 5 deaths in 360 cases, and MacLennan states that there was one death in his own series, the number of which is not stated.

Still stronger evidence against the tendency to operate upon all cases of hernia in infancy will be found in a paper of Ochsner's,<sup>1</sup> on "The Treatment of Hernia in Children."

Twenty-six years ago, Ochsner's attention was first called to the fact that many cases of hernia in infants were promptly cured without operation, and this opinion was still further confirmed by his observations in several cases of strangulated hernia in children, in whom the hernia was reduced and recurrence was prevented by placing the child in the exaggerated Trendelenburg position.

In going over the literature on the subject, Ochsner found that Malgaigne had made a most exhaustive study of the question, in connection with the surgical service of the French Army sixty years ago. Malgaigne's statistics show that there was one hernia for every twenty-one children in the first year of life, which proportion remains about the same until about the age of six years, when there is a rapid decrease until there is but one hernia in seventy-seven children at the age of thirteen. After this age, there is a rapid increase of herniæ in the male until the age of twenty to twenty-one, when there is one hernia in every

<sup>1</sup> Oration in Medicine, delivered at the forty-fourth annual meeting of the Minnesota State Medical Association, at Duluth, August 13-14, 1912.



thirty-two males. In the female there is no further increase until the beginning of the child-bearing period, when there is a rapid increase in number. At the age of twenty-eight there is one hernia for every twenty-one persons.

Ochsner states, that the large material of Malgaigne showed that, without surgical treatment, over 75 per cent. of all herniæ healed spontaneously before the child had reached the age of twelve to thirteen years; also that at this age and during the following six or eight years there are almost no herniæ in girls, while in boys there is a very rapid increase during this period. He further states: "In our experience only about 5 per cent. of the adults coming under our care for treatment of hernia give a history of having had herniæ during childhood. This corresponds almost exactly with the observation of Berger, who states from his statistics that of 9967 adults with hernia, only 479 gave a history of having suffered from this condition since childhood. Bull and Coley's statistics show almost identical proportions. Out of 15,000 adults with hernia, only 700, or less than 5 per cent. have been ruptured since girlhood. This proportion is borne out in a remarkable manner by the fact that the 400 cases, which the latter authors had selected for operation, were chosen from 8000 children suffering from hernia, which indicates that there were not more than 5 per cent. of the children examined in whom it seemed necessary to treat the condition with operation. All of these facts show that the tendency toward closure of the natural abdominal openings, which should have been completed before birth, continues during childhood, if there is not a very marked anatomical defect beyond the fact that the peritoneal projection into the canal has not been closed, and provided also that the abnormal intra-abdominal pressure has been eliminated."

Ochsner states, in conclusion, that approximately 95 per cent. of all cases of hernia in children will heal spontaneously if the abdominal intra-abdominal pressure is relieved and the hernial sac is kept empty. This can be accomplished by means of trusses, or, much more rapidly in inguinal and femoral hernia, by placing the child in bed with the foot of the bed elevated. The time required, Ochsner states, usually does not exceed six weeks and in most cases the hernia will heal upon relieving the abnormal intra-abdominal pressure and simply placing the child in bed with the foot of the bed elevated each night, from 6 P.M to 8 A.M. the following morning, for several months.

**Inguinal Hernia in Children.** Stone<sup>1</sup> makes an important contribution to the study of the *operative treatment of inguinal hernia in children*. He reports 1019 cases operated upon at the Children's Hospital. He calls attention to the difficulty in making the correct diagnosis in children, and distinguishing between encysted hydrocele of the cord and a hernia. He states that "hydrocele of the cord which has retracted

<sup>1</sup> Boston Medical and Surgical Journal, April 2, 1914.

within the canal cannot be differentiated from a hernia unless it is drawn downward sufficiently to get a finger above it and find no abnormal contents of the canal."

I would not agree entirely with this statement. It is true that one cannot differentiate the two conditions by physical examination alone, but the only form of hernia that could be mistaken for a hydrocele of the cord in the inguinal canal, is a strangulated hernia, and while the physical signs are practically the same in both conditions, one is always able to differentiate them by the clinical history and general symptoms. If a hydrocele, there will rarely be a history of sudden appearance. The mother will state that she had noticed the tumor for a number of days or weeks, which would rule out a strangulated hernia. I have been called to operate on a case of "strangulated hernia" in an infant, and all the preparations had been made for operation, when the condition was a hydrocele of the cord. The general condition of the child was perfect: there was no nausea or vomiting, no constipation, so that it was evident that we were dealing with a hydrocele of the cord and not a hernia.

Stone states there have been a few instances of suppurating hydrocele of the cord.

There may be such cases recorded in the literature, but, in our experience at the Hospital for Ruptured and Crippled within the last twenty-five years, none has been observed.

In regard to the *treatment*, it is stated that it is the rule of the hospital to advise operation practically in every case, that palliative treatment holds back the hernia, but does not effect a cure. Stone states:

"In many instances, after prolonged use of a truss, the hernia does not again appear. But the longer these patients are followed and the more carefully they are studied, the fewer become the cases in which one finds that the hernial sac has become obliterated. While the sac remains patent, there is always a potential hernia. The risk of such a potential hernia depends upon the proximity to skilled surgical aid in case of need.

As the children are brought to the hospital, the practical question which arises is whether there is any contra-indication to operation. If any exists, some form of truss is advised. If there is no contra-indication, operation is advised. Largely on account of the lack of beds for infants, operation is usually performed after the child is two years old. But entirely independent of that consideration, unless special reason arises, operation is not usually advised until after the babies are weaned and have a good start in life. The risks from operation, slight as they are, seem less in older children."

For palliative treatment, Stone advises the worsted truss.

The worsted truss was given a thorough trial at the Hospital for Ruptured and Crippled during 1888 to 1890, and, having proved much less efficient than the light spring truss, was discarded.



The routine operation performed at the Children's Hospital has been a modified Bassini, the cord not being transplanted.

As to dressing the wound, it is stated that usually a cocoon is made of a few layers of sterile gauze and fastened over the wound with flexible collodion. This practically protects the wound from the urine. Ordinarily a gauze pad and a spica bandage are applied outside of the collodion dressing. Various ways are described of preventing the wetting of this dressing.

The time of keeping the children in bed has been cut down from eighteen days in the earlier cases to ten to twelve days at the present time; they are discharged at the end of a fortnight.

No data are given showing the results of treatment.

Our statistics at the Hospital for Ruptured and Crippled give an opportunity of comparing the relative efficiency of the typical Bassini operation and the modified Bassini (the cord not transplanted), while the results were nearly ideal in both methods the percentage of relapses were higher in the modified Bassini. In adults the difference was still greater.

The question of the treatment of inguinal hernia in children is discussed in an able paper by Hertzler,<sup>1</sup> of Kansas City, Missouri.

He states that a truss has been used for infants only a comparatively short time. It was formerly considered inadvisable on account of the probability of producing eczema or even gangrene. The old idea that a sac can be obliterated by the pressure of a truss is still entertained by a certain number of practitioners. He states that most physicians content themselves with the use of the well-known skein, or worsted, truss. He calls attention—and, I believe, justly—to the inefficiency of this truss, and states that it hides more frequently than retains the hernia. The objection to the steel band truss in children is that the pressure is apt to be too great, causing excoriations.

I pointed out this disadvantage of the worsted truss nearly twenty years ago, and at the Hospital for Ruptured and Crippled we have not used it since. Our routine treatment is to apply a cross-body truss of the Knight type, made of thin Norwegian steel, covered with rubber tubing. From the end of the anterior portions of the truss a small piece of steel is riveted on at right-angles with the main portion, about one-half to one inch in length. To this is attached a small wooden pad covered with chamois skin. The steel is so tempered that any desired pressure can be used in the individual case. We have found this truss extremely efficient, and, if properly applied, it practically never causes excoriation.

Hertzler again calls attention to the statistics of Stiles, and states that he "perhaps has spoken with the greatest authority." He operated

<sup>1</sup> Journal of American Medical Association, November 22, 1913.

upon 360 cases, mostly infants and young children, with five deaths—one of infection, one from chloroform, one from gangrene, and two from causes not stated, and four recurrences. Hertzels summarizes his conclusions as follows:

“1. All inguinal hernias in infants are due to persistence of the processus vaginalis.

“2. Inguinal hernias are not cured by the truss and rarely recover spontaneously.

“3. Surgery is permissible in all cases if the facilities are of the best and the operator is skilful. Operation is urgent if the hernia protrudes persistently or if the child is annoyed greatly by retentive appliances which lessen his activities or produce excoriations. Operation is demanded if the hernia is irreducible or strangulated.

“4. Because of the difficulty of maintaining an aseptic field after operation, it is wise conservatism to wait until the child has reached such an age as will enable him to lend his coöperation, that is, until about the fourth year.

“5. Palliation is demanded when organic disease is present or adequate facilities for operation are not at hand.”

These conclusions represent practically the opinion held by Dr. Bull and myself for many years. While it is our rule, in cases in which the hernia is easily held by a truss, to wait until the child has reached the age of four years—if the hernia is held with difficulty, and if for any reason the child is unable to receive careful supervision of the mechanical treatment, I would advise earlier operation. With the use of plaster of Paris, extending from the pelvis to the knee, I believe that the wound can be kept perfectly aseptic. The chief advantage of the plaster of Paris is that it keeps the part at rest, and a wound at rest heals better than one in motion. I know of no other way of keeping a dispensary child at rest.

**New Methods of Operation for Hernia.** During the past year there has been a revival of the operations for femoral hernia, introduced several years ago, based upon an attempt to close the femoral opening by the introduction of foreign bodies of various kinds. Clayton Greene<sup>1</sup> reports a case of femoral hernia treated by bone transplantation, and he believes that this case suggests a method of dealing with large inguinal as well as femoral herniæ. He states that the numerous articles recently published on the subject of bone-grafting suggested to him the possibility of closing the entrance to the femoral canal by a bony transplant connected with the pelvis. The operation which he reports was performed in a male patient, aged fifty-seven years, with double femoral hernia of fourteen years' duration. The operation was performed on May 28, and as the case is reported on July 14, the interval

<sup>1</sup> *Lancet*, July 18, 1911.



is manifestly too short to enable one to judge of the permanent value of the operation.

In this operation he resected two inches of the eleventh rib subperiosteally, and the bone was split into two pieces through the cancellous tissue. The femoral wound was then widely retracted and the bone grafts were introduced into pockets made in the periosteum at the back of the pubic bone. The left hernia, which was much smaller, was dealt with in the ordinary way. The wound healed without suppuration.

As to the bone most suitable for grafting for this purpose, he believes that a rib is perhaps not the best, and that should another occasion arise, he would select the tibia.

Fiarchi, an Australian surgeon, reports a case in which, instead of a bone, he used a perforated celluloid plate to lock up the femoral canal, believing that the fibrous tissue would gradually work its way

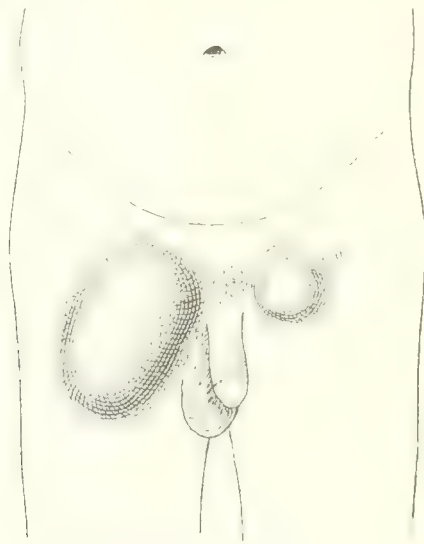


FIG. 1.—Large right and small left femoral herniæ.

through the perforations and build up a solid wall which would prevent a recurrence of the hernia.

The first operation of this type I had the privilege of observing at the New York Hospital in 1889. It was performed by Dr. Robert F. Weir. A portion of bone, which was removed from the scapula of a dog at the same time that the operation for the hernia was performed, was inserted in the hernial opening. Whether due to the fact that surgical technique at that time had not reached the perfection it has since attained, I do not know, but high temperature developed on the second day, with local swelling and the bone had to be removed on the third day.

I am very much opposed to the use of any foreign body for the cure of hernia—femoral, inguinal, or ventral—whether the body be bone, celluloid, or filigree of silver wire. My objections to these have already been stated in previous articles in *PROGRESSIVE MEDICINE*. The

principal objection to their use in femoral hernia is that by a simple operation—high ligation of the sac with closure of the canal by purse-string suture—one can cure practically all cases of femoral hernia. Therefore, there is no need for the complicated operation described.

My second objection is the uncertainty as to what may happen to the bone or foreign body introduced to close the opening. Data are lacking upon which to base any conclusions as to what happened to the bone removed from the same patient, but I have much evidence to show that foreign bodies, such as silver wire and celluloid, not infrequently cause the late development of sinuses, making it necessary to extract the foreign body, and almost always resulting in a relapse of the hernia.

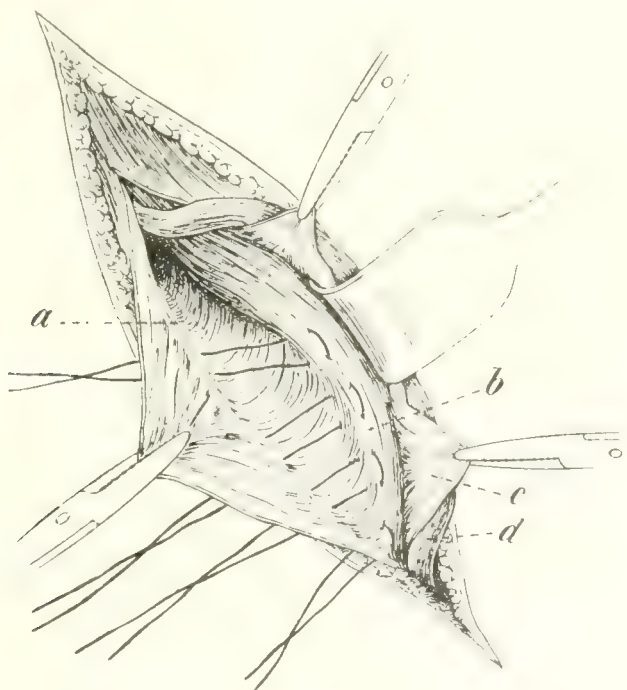


FIG. 2.—*a*, Poupart's ligament; *b*, conjoined tendon; *c*, aponeurosis of the external oblique; *d*, cord retracted inward and lying superficial to external oblique.

O'Connor, senior medical officer at the British Hospital, Buenos Aires, who has had a very large experience with inguinal hernia, advocates a modification of Halsted's and Bassini's operation. In the *British Medical Journal* of July 18, 1914, he states that "any surgeon who has performed a thousand hernia operations must frequently have been struck by the difficulty of preventing the fibers of the inner shelf of Poupart's ligament splitting when inserting the necessary approximation sutures." In order to obviate this, he has tried various forms of needles, but found little difference in the result, except that on two occasions, when using sharp curved needles, he wounded the external iliac vein, requiring a Chopart amputation of the foot in one, no harm following in the other. The object of his modification is to eliminate such regrettable incidents and fulfil the anatomical conditions which



form the basis of the Halsted and Bassini operations. The method of introduction of the sutures is shown in the three accompanying cuts.

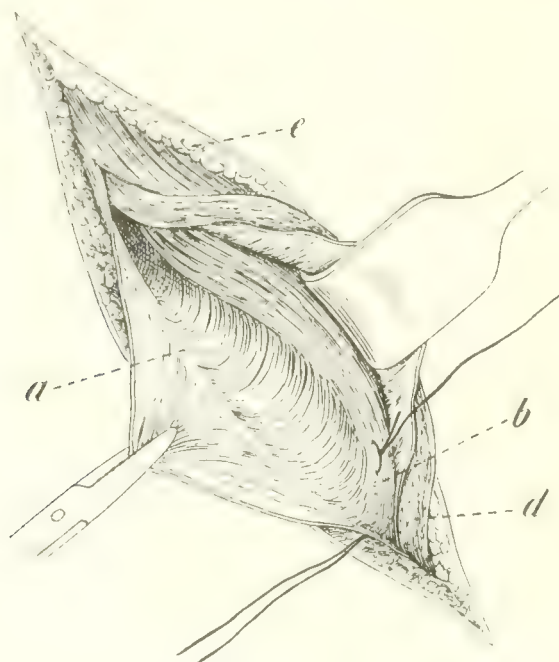


FIG. 3.—Insertion of first stitch through Gimbernat's ligament and conjoined tendon. *a*, Poupart's ligament; *b*, conjoined tendon; *d*, cord retracted inward; *e*, external oblique.

The cord is left, as in the Halsted operation, superficial to the external oblique muscle. He states that this operation only differs from that

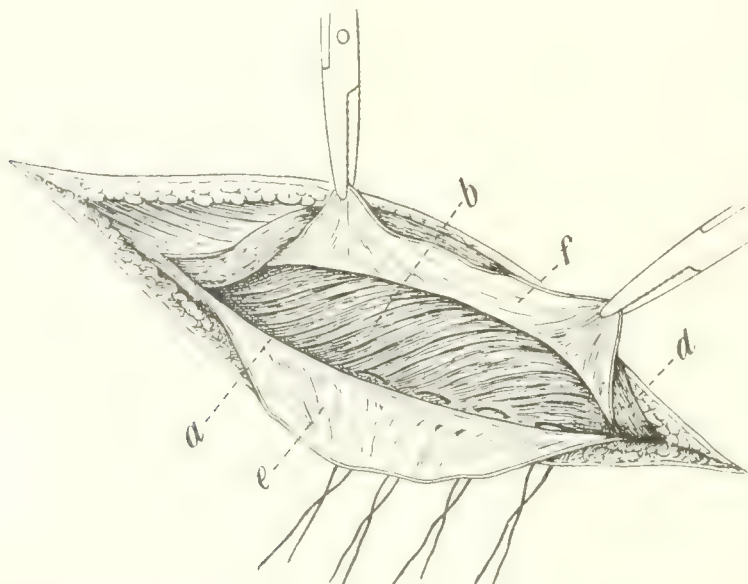


FIG. 4.—*a*, Poupart's ligament (lower shelf); *b*, conjoined tendon; *d*, cord retracted inward; *e*, external oblique—external leaf; *f*, external oblique—internal leaf.

of others in the manner of introduction of the deep sutures, but he is convinced that the modification is important, "in that it affords a

simple and absolutely safe method of approximating somewhat delicate tissue in a rather dangerous zone."

My principal criticism of the modification is that it leaves the cord superficial to the aponeurotic layer, covered only by the skin and subcutaneous tissue. The disadvantage of this position is that it favors a recurrence of the hernia at the point where the cord emerges from the deeper layers, as there is lacking the protecting barrier of the aponeurotic fascia which, I believe, is a very essential feature of the Bassini operation.

As regards the danger of such "regrettable incidents" as referred to by O'Connor, I would say that a reasonable amount of care in observing certain important precautions, will reduce these risks to a minimum. At the Hospital for Ruptured and Crippled we have now operated upon nearly 5000 cases of hernia since 1889, of which 4317 were inguinal hernia. Thus far, not a single accident to the vessels has occurred. I have also operated upon about 1500 additional cases, outside of the hospital, without such accident.

The precautions I have observed have been simply lifting Poupart's ligament upward and inward and introducing the suture from below upward, first into the internal oblique and then into the shelving process of Poupart's ligament. I have used a sharp, curved Hagedorn needle for this purpose since 1890, but contrary to the custom which generally obtains, I have discarded the needle-holder, using the fingers instead. Much more delicate work can be done with the fingers than with the rigid needle-holders and the risk of injuring the vessels is materially lessened. Hence, I believe that the Bassini operation is still much to be preferred to the modification advocated by O'Connor.

**Recurrent Hernia.** Pólya<sup>1</sup> publishes a very exhaustive anatomical study on the cause of recurrence after radical operation for inguinal hernia. He bases his report on the anatomical investigations made in 25 cases operated upon for recurrence at the clinic of the Budapest University within the last eighteen months and appends brief histories of the cases. He divides his anatomical findings into eight general classes, and again subdivides these into the following three principal forms of recurrence:

1. Those due to incomplete closure of the inguinal canal, which he found in 21 cases.

2. Those resulting from too strong pulling upward of Poupart's ligament (crural recurrence), 7 cases.

3. Large diastases or great distention in the musculo-aponeurotic tissues of the inguinal canal, due to suppuration, observed in 4 cases.

Pólya also made extensive studies on the cadaver, which he reports in detail, the practical results of which may be briefly summed up in the following:

<sup>1</sup> Arch. f. klin. Chir., 1912, Band 99, Heft 3.



Exact closure of the inguinal canal requires, in the great majority of cases, suturing of the rectus to Poupart's ligament, which can be done without tension only after extensive splitting of the rectus sheath. Closure can be still further secured by doubling of the aponeurosis of the external oblique and lateral transplantation, and kinking of the cord.

Permanency of closure is insured only by an aseptic wound healing and the use of non-absorbable sutures.

I cannot agree with the author in his statement that the exact closure of the inguinal canal, in the great majority of cases, requires suturing of the rectus to Poupart's ligament. This procedure, I believe, should be employed in all cases of direct hernia, but in the ordinary oblique hernia it is superfluous, as shown by our results at the Hospital for Ruptured and Crippled, quoted elsewhere. The other procedures which he recommends, *i. e.*, doubling of the aponeurosis of the external oblique, lateral transplantation, and kinking of the cord, are also, in my opinion, superfluous. Although he advocates the use of non-absorbable sutures, such sutures, I believe, cannot be condemned too strongly. Their dangers and disadvantages I have referred to in another part of this article.

**Postoperative Hernia.** v. Wrzesniowski,<sup>1</sup> of Czenstochau, Poland, refers to the Mayo overlapping method for the radical cure of post-operative hernia and cites the two important factors emphasized by Judd in connection with this method:

1. The strong tendency of the peritoneum to form adhesions, which insures rapid and firm growing together of the peritoneal surface of the upper with the aponeurosis of the lower flap.

2. The technical difficulties in preparing and suturing each single anatomical layer and the uncertainty of the success of the method, inasmuch as the abdominal muscles often have become greatly atrophied by the time of the hernial operation.

Judd reports 242 cases of postoperative hernia operated upon at St. Mary's Hospital by the overlapping method, within the last seventeen years, with 13 recurrences, or 5.4 per cent., and one death, due to acute dilatation of heart.

Wrzesniowski states that he used the Mayo overlapping method in 4 cases, in 3 of which the herniæ were not particularly large and the operation was easily performed and the result remains satisfactory.

He states that he has applied this idea of the Mayo's for the direct suture of laparotomy wounds in the linea alba, the usual suture giving no security against subsequent hernia formation. He makes the borders of the wound (without skin and subcutaneous tissue) overlap 3 to 5 cm. and sutures them together, dissecting away any superficial skin and subcutaneous flap parts, and uniting the borders of the latter. In the case of larger incisions, beginning above and

<sup>1</sup> Arch. f. klin. Chir., 1914, Band 106, Heft 1.

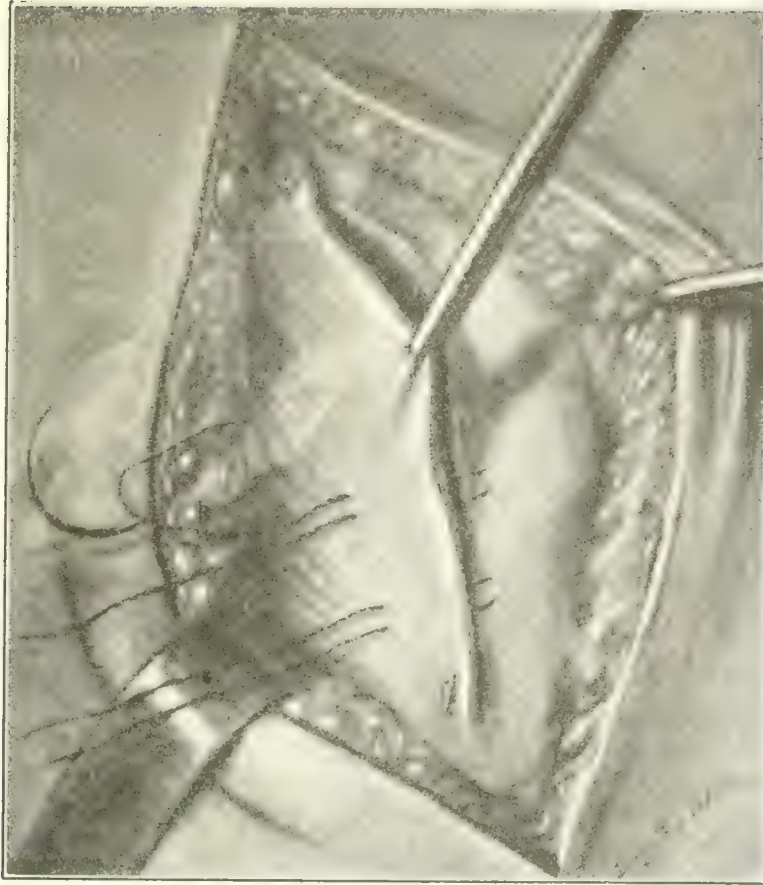


FIG. 5

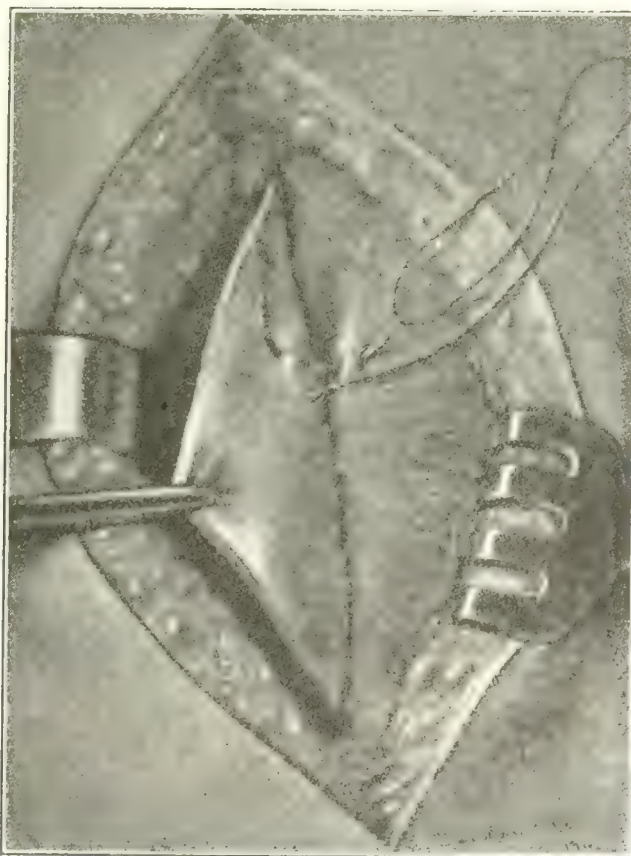


FIG. 6



extending below the umbilicus, the right half of the abdominal wall is placed under the sutured parts—this on account of the *ligamentum teres hepatis*.

Wrzesniowski states that if the abdominal layers are carefully sutured in this manner, a postoperative hernia becomes an impossibility. He states that he has used this suture in 17 cases of laparotomy in the *linea alba* and has never seen a hernia to follow such incision. He cites the case of a patient who had been operated upon a year before for a very large multilocular ovarian cyst, with thick, gelatinous contents, necessitating an incision extending from within 2 cm. of the xiphoid process to the symphysis. The above described method of closing the wound was used and the patient, who is doing heavy factory work, shows no trace of a hernia.

Wrzesniowski further describes an overlapping method for the radical cure of inguinal hernia which he has employed seventeen times in thirteen patients, since April, 1913, three times for incarcerated hernia, though not gangrenous, and he has not seen a single relapse so far. The principle of this operation, which he describes in detail, is to reinforce the lowest part of the abdominal wall (the part subjected to the greatest pressure from within) by strong abdominal muscles. The lower flap is pushed under the upper and is secured by mattress sutures. The upper flap—the muscles with their aponeuroses—is sutured to Poupart's ligament.

Wrzesniowski emphasizes the importance of remembering that none of the overlapping methods can be successfully performed with the abdominal wall tense; the muscles must be relaxed. He states that after the muscles with their aponeuroses have once been doubly sutured one upon the other, even strong abdominal pressure is incapable of impairing the success of the operation.

He considers silk-worm gut the only absolutely safe suture material.

I believe the overlapping method of Mayo is practically invaluable in all forms of umbilical and ventral hernia, although it is rarely indicated in cases of inguinal hernia. One of the most important fields that I have found, for applying the overlapping method, is in ventral hernia following an operation for acute appendicitis, in which drainage had been employed with the not infrequent result, *i. e.*, a hernia of considerable size. I have seen herniæ the size of a child's head, in a rather obese woman with flabby abdominal walls, entirely cured by this method of treatment, the patient remaining well over ten years.

I again desire to protest against the use of silk-worm gut as a buried suture in any operation for hernia, in fact it should never be buried at all in any operation.

Waljaschko and Lebedew<sup>1</sup> on basis of experimental findings have devised a method of *free transplantation of the aponeurosis as a pro-*

<sup>1</sup> Arch. f. klin. Chir., 1913, Band 101, Heft 4.

*phylaxis against the recurrence of hernia*, or protrusions of the abdominal wall after laparotomy. The technique of the proposed method is briefly as follows:

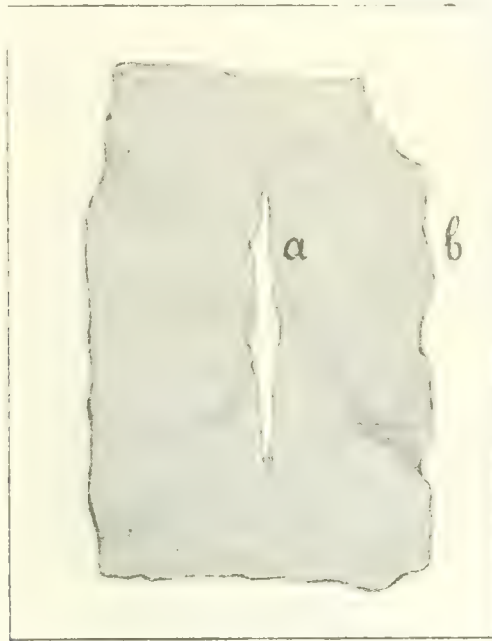


FIG. 7.—Aponeurotic flap prepared for transplantation into the abdominal wound. Border *a* is sutured together with the transverse fascia and peritoneum; border *b* with the superficial aponeuroses.

Excision of an aponeurotic flap out of the fascia lata of the external surface of the thigh, of such size as will amply cover the entire thickness of both sides of the wound. An opening is made in the middle of this flap (Fig. 7); the borders of this opening are united by suture with

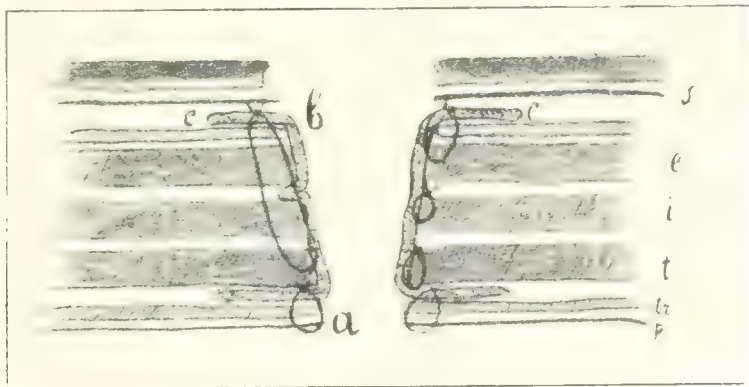


FIG. 8.—Sketch showing position of the flap *c* and of the sutures in the transverse incision of the abdominal wall; *s*, superficial fascia; *e*, *i*, *t*, external and internal oblique, and transverse muscle; *tr*, transverse fascia; *p*, peritoneum; *a*, *b*, same as in Fig. 7.

the borders of the peritoneum and transverse fascia. Successive suture of the different layers of the muscles of the abdominal wall to the surface of the aponeurotic flap without piercing the latter, either by means of single (Fig. 8, right side) or mass sutures. The borders of the trans-



planted aponeurosis extending beyond the wound, are turned back upon the superficial aponeurosis of the fascia and there sutured. The ends of the flap are fastened into the angles of the abdominal wounds which remain open. The advantages of this procedure as pointed out by Waljaschko and Lebedew, are: (1) the depth of the surface of the wound is not lessened; (2) the layer arrangement of the abdominal wall remains undisturbed in the region of the borders of the wound; (3) the severed bundles of muscle cannot escape from the plane of incision; (4) the tissues of the abdominal wall remain separated for a comparatively long period from the granulating process going on within the open wound. Incomparably better results are therefore obtained by secondary suture. Finally there is the possibility of placing a secondary layer suture.

As complicating factors, Waljaschko and Lebedew mention necrosis of the transplanted aponeurotic flap, which may here easily set in. Most favorable are the conditions when the freshly excised fascia remains in close and wide contact with the surface of the wound, while the borders and ends of the flap reach far into some of the loose intermediate layers of the abdominal wall.

Personally, I believe the disadvantages of this method outweigh its advantages. The supposed value of scar tissue in an abdominal wound was long ago disproved by the results of McBurney's operation for inguinal hernia.

**Results of Operation for the Radical Cure of Hernia at the Hospital for Ruptured and Crippled, New York.** The operative statistics of the Hospital for Ruptured and Crippled, from December, 1891, to January, 1915, are as follows:

Of a total of 4774 cases, 3448 were indirect herniæ in the male, with 23 recurrences, or 0.67 per cent., 19 were direct herniæ without recurrence; 869 operations were performed for inguinal hernia in the female, namely, 295 in adults and 574 in children, with 12 recurrences, or 4 per cent. in the former, and 1 recurrence, or 0.17 per cent., in the latter, or a percentage of 1.5 for children and adults together. Seven were direct herniæ with one recurrence, or 12.5 per cent., 203 femoral herniæ with 6 recurrences, or 2.95 per cent.; of these 63 were in children, without recurrence; 140 in adults, with 6 recurrences, or 4.28 per cent. (4 of these recurrences were for previous femoral recurrences). One hundred and thirty-three operations were performed for umbilical hernia, with 3 recurrences, or 2.3 per cent. Of these, 46 were in children, without recurrence; 87 in adults, with 3 recurrences, or 3.45 per cent.; 79 operations were for ventral hernia, with 10 recurrences, or 12.63, *i. e.*, 17 in children, without relapse; 62 in adults, with 10 recurrences, or 16.1 per cent. Epigastric herniæ 14, with 1 recurrence, or 7.14 per cent.; and one lumbar hernia without recurrence.

**METHODS OF OPERATION.** 3448 operations were performed for inguinal hernia in the male, that is, the typical Bassini operation was performed in 2751 cases, with 14 relapses, or 0.51 per cent.; in 697 cases the modified Bassini operation was performed, the internal oblique being sutured to Poupart's ligament, without disturbing or transplanting the cord. In this series there were 10 relapses, or 1.43 per cent.

Of 133 operations for umbilical hernia, 31 were operated upon by the older method, with 2 relapses, or 6.4 per cent.; in 102, Mayo's overlapping method was done, with only 1 relapse, or 0.98 per cent.

Sixty-four superficial inguinal and interstitial hernia were performed without recurrence.

It is interesting to note that 250 operations were performed for hernia associated with an undescended testis. The technique used in these operations was the Bassini operation, without transplantation of the cord. In a few cases Bevan's operation, with removal of the veins of the cord, with exception of the vessels of the vas, was used without any untoward results. No case of recurrence has been observed in this series.

Thirty-three operations were performed for strangulated hernia, nearly all in children under the age of two years, with two deaths, which both occurred in adults.

The total number of deaths in the entire series of cases, including the cases of strangulation, was 10, or 0.21 per cent.

**Disadvantages of Non-absorbable Sutures in Hernia Operation.** Ehler,<sup>1</sup> in an article on "Herniology and Inguinal Hernia," calls attention to a very important matter which has received far too little attention by surgeons, namely, the disadvantages of using non-absorbable buried sutures in the radical operation for hernia. In that part of the article dealing with chronically inflamed swellings of the abdominal wall following operations for hernia, he cites some cases which are worthy of a brief abstract:

**CASE I.**—Male, aged forty-six years; operated upon two years before for right-sided crural hernia which could not be reduced, and a left-sided inguinal hernia. Later on, there developed, at the insertion of the right rectus muscle on the symphysis, a tumor the size of an egg, hard and nodular, which seemed to be connected with the bladder. The diagnosis lay between a carcinoma of the bladder and a tumor of inflammatory origin. An operation was performed, and, on opening the peritoneum, a tumor made up of omentum and the posterior surface of the crural hernia scar was found. "It extended into the bladder as a tumor with concentric tags, and consisted of chronically inflamed connective tissue." It arose at the site of an infected silk ligature.

<sup>1</sup> Surgery, Gynecology, and Obstetrics, August, 1913.



There was also a fistulous tract toward the bladder and it was found necessary to resect one-fourth of the bladder.

CASE II.—A man, aged forty-two years, had been operated upon for left inguinal hernia not long before admission to the clinic at Prague. A tumor had developed at the site of a fistula which still persisted at the time of admission. A tumor in the abdominal wall was found the size of a loaf of bread, 23 cm. in diameter, which apparently extended into the abdominal cavity. It was hard and nodular in consistence. There was an occasional rise of temperature. Spontaneous rupture finally occurred, and in the material evacuated there were found several silk ligatures which had been inserted at the time of the hernia operation. The tumor gradually disappeared.

Ehler cites two other cases of inflammatory tumors following fistulæ after radical operation for hernia. He believes that while it is impossible to make a positive differential diagnosis in these chronically inflamed new formations from fibrosarcoma, if they appear at the site of a previous hernia, operation running a clinical course of a slowly increasing tumor without affecting the adjoining organs, it is fair to assume that it is an inflammatory tumor resulting from an infected ligature.

The author apparently confines himself chiefly to the diagnosis and treatment of these swellings instead of offering a very simple rule by means of which they could be prevented altogether, namely, to abandon all kinds of non-absorbable sutures in the treatment of inguinal hernia.

Nearly twenty years ago, Dr. Bull and myself called attention to a series of cases observed at the Hospital for Ruptured and Crippled, illustrating the disadvantages of the use of non-absorbable sutures, and strongly urged substituting absorbable sutures which could be perfectly sterilized and offered the same possibilities of radical cure, without the risk of such serious results as Ehler calls attention to.

At the present time, with chromicized kangaroo and chromicized catgut tendon, both of which we know can be perfectly sterilized, there is no reason for continuing to use other than absorbable sutures.

**The Undescended Testes.** Uffreduzzi,<sup>1</sup> of Carle's Clinic in Turin, Italy, publishes an exhaustive study on the *pathology of the retained testicle*. He states that the uncertainty which prevails as to the cause of the normal descent of the testicle naturally also makes itself felt as to the causes of ectopia of the testicle. The explanations offered by many of the earlier writers on the subject he characterizes as exceedingly naive, in that these authors confound the cause of the anomaly with its accompanying symptoms or results. Kocher has tried to explain the incomplete descent of the testicle, as well as the atrophy of

the gland, by an inflammatory process during intra-uterine life, but has not corroborated his hypothesis by objective findings.

Cloquet and Wrisberg attribute retention of the testicle to peritoneal adhesions, caused by inflammatory processes in that part of the peritoneum which, during fetal life, forms the vaginal process.

This latter theory has recently been revived by Büdinger, who has supported it by numerous necroscopic and operative findings. These adhesions may appear in two different ways, *i. e.*, they either directly involve the testicle and abdominal organs, or the peritoneum alone, in the latter event, in the shape of constricting cicatrices invading the surrounding tissues, encircling the vessels of the cord and preventing the descent of the vaginal process and, hence, also of the testicle. Büdinger found this to be the probable cause of retention in 15 of 24 cases, and believes it to be the most common cause of retention (96 to 97 per cent.). He estimates the cases in which a congenital origin of retention is apparent (pseudohermaphroditism) at 2 to 3 per cent.

Uffreduzzi states that the main objection that might be raised to Büdinger's statement is the point of frequency of such cicatrices, no other investigator having found them as frequent as he did. Lanz expressly declared that he found no such cicatrices in any of his 51 cases, nor did Uffreduzzi himself make a single such observation. (My own observations, based upon 200 personal operations for undescended testicle, are in accord with Uffreduzzi's.)

Félizet, as also Kocher, believe that atrophy and retention of the testicle represent two simultaneous phenomena due to the same cause, namely, a primary lesion of a vessel.

Uffreduzzi refers to the classical paper of Godard's who cites heredity as a cause of ectopia, and believes that a certain amount of influence from this source cannot be denied.

He further calls attention to the fact that the descent of the testicle as it takes place in man is nothing but a recapitulation of the phylogenetic migration as it gradually takes place in zoölogical evolution. Hence, he states, some authors consider retention of the testicle as a simple continuation of a condition that is normal in certain animals, and that a retained testicle must be looked upon as a sign of arrested development. I have operated upon a boy of thirteen years with double abdominal ectopia, who has a younger brother with double abdominal ectopia which would point to an hereditary element.

Uffreduzzi states that in the great majority of cases of ectopic testicle there are other signs of degeneration. Of 24 cases examined by himself, he invariably found a greater or less number of distinct anomalies, physical as well as mental. In one case, bilateral cryptorchism was associated with true hermaphroditism. This extremely rare form of hermaphroditism, of which only two other cases are recorded in the literature, represents one of the most serious forms of degeneracy known.



On basis of his investigations, Uffreduzzi concludes that retention of the testicle is hardly ever an isolated fact, but merely a local expression of infantilism, *i. e.*, of a serious retardation in the development of the entire individual, which may be more or less pronounced and is nearly always accompanied by other bodily or mental symptoms.

Uffreduzzi has made an exhaustive study of the literature with reference to developmental anomalies of this kind in idiots, and mentions Bournville and Sollier's statistics, comprising 758 cases of idiots, which showed such anomalies as phimosis, hypospadiac atrophy, retention of the testicle, various malformations of the penis, in a considerable number of cases.

Knecht's statistics, covering 379 individuals belonging to this group, shows: Phimosis, 51 times; bilateral retention of testicle, 11 times; atrophy of the testicle, 18 times; epispady, twice; hypospady, 5 times; varicocele, 12 times.

Uffreduzzi's own examinations made at Morro's Institute for Insane, covering 100 cases, show 47 simple epileptics; 7 epileptic idiots; 12 cretins; 14 phrenosthenics, etc. In 18 of these 100 cases he found an ectopic testicle (6 bilateral and 12 unilateral).

As regards histology, Uffreduzzi states the structure of the retained testicle varies greatly in the individual cases. The principal changes that are nearly always found are thickening of the albuginea, and of the basal membrane of the tubuli and a great increase in interstitial cells.

In a chapter on the pathology of the retained testicle, Uffreduzzi discusses the various complications that are apt to accompany the condition of ectopic testicle, and which, in order to differentiate them from the congenital complications, he designates as secondary or acquired. Among these are pain and nervous disturbances; septic and sanious infection; specific or chronic inflammation; gangrene and incarceration of the testicle; torsion of the cord. (In a series of 80 cases of torsion of the cord collected by Uffreduzzi a retained testicle was found in 60 per cent.)

The most common complication of undescended testicle is hernia, which, in rare cases, may be acquired. Further complications are hydrocele of the cord and neoplasms.

That the retained testicle frequently becomes the seat of tumors, was first claimed by Lecomte, in 1851, and has since been confirmed by many others. The only opposing voice that has been heard is that of McAdam Eccles, who observed 859 cases of retained testicle in a series of 48,000 cases of hernia, without a single case of tumor. Further, of 40 cases of sarcoma of the testicle observed during twenty years at a large London Hospital, only one had a retained testicle. According to this, tumors of the retained testis would represent but 2.5 per cent. of all tumors of the testicle. However, Odiorne and Simmon's statistics, comprising 54 cases of malignant tumors of the testicle, showed 6 cases

of retained testicle, 11 per cent. Howard computed a percentage of 18. Formerly I held the same opinion that Eccles holds, based upon the fact that among upward of 80,000 cases of hernia observed at the Hospital for Ruptured and Crippled (though there were more than 1000 cases of undescended testis), there was no case of sarcoma of undescended testis. This really is not a sound argument, for the reason that patients with sarcoma of an undescended testis would go to a general hospital. Of 64 cases of sarcoma of the testis that I have observed, 12 occurred in the undescended testis.

Uffreduzzi is of the opinion that the retained testicle is more frequently the seat of malignant degeneration than the normally descended gland, although this frequency has often been greatly exaggerated. Sarcoma is apparently the most common type of tumor in ectopic testicle, particularly in inguinal ectopia.

Uffreduzzi's conclusions are:

1. That in the majority of cases a retained testicle is a congenital malformation which practically always occurs in conjunction with other more or less pronounced developmental defects of the sexual organs as well as other parts of the body of a physical as well as mental nature.

2. Anomalies in structure and atrophy usually accompany mal-descent of the testicle, but are not a result of the malposition. The latter is not the only nor the most important, factor in ectopic testicle, and, if at all, it comes into consideration only at a late stage, in that it hastens retrogression of the gland.

3. The early passage of the retained testicle into the postfunctional stage is due to a great extent to the scarcity of properly developed canaliculi and to the rapidity with which retrogression occurs in most of the canaliculi in which spermatogenesis does not take place.

4. However, the number of canaliculi with complete spermatosis in the retained testicle is greater than is usually believed, being about 10 per cent.

5. The retained testicle as such does not give rise to trouble, but complications, such as hernia, torsion, and malignant degeneration frequently set in.

6. The persistence of the vaginal process of peritoneum or inguinal hernia are almost constantly present in ectopic testicle. In the cases in which obliteration of the vaginal process occurs, this is limited, and the vaginalis is invariably wider than normal and frequently reaches up to the internal orifice of the inguinal canal.

7. Torsion is more common than is generally assumed, inasmuch as only severe cases with pronounced symptoms come to operation, while the less severe and spontaneously receding cases either remain unobserved or are not correctly diagnosticated.

8. It is a fact that the retained testicle shows great tendency to malignant degeneration, although this has been greatly exaggerated.



Uffreduzzi appends brief histories of 81 cases of retained testicle observed at the Surgical Clinic of the Royal University, Turin.

Fischer<sup>1</sup> gives a careful review of the various *procedures devised for the treatment of ectopic testicle*. He divides these methods into two general classes, *viz.*, those which consist in isolation of the cord; division of the vaginal process and fixation of the testicle within the scrotum and those which transplant the testicle outside of the scrotum. As to the former, he points out the difficulty of preventing retraction of the transplanted testicle, a tendency which, he states, is due to the fact that the loose tissue of the scrotum furnishes no firm hold for the fixating sutures, even though sufficient length of the cord has been obtained for the purpose. This fact, he declares, furnishes the *raison d'être* for the second class of procedures which aim to anchor the ectopic testicle to a point of firm support outside of the scrotum (Nicolandronid, Keetly, de Beule, Katzenstein).

Fischer points out the shortcomings of all of these operations, and then proceeds to describe his own method, as follows:

After freeing the cord, the proximal portion of the vaginal process, and the inguinal canal are closed according to Bassini, then a long, stout, silk-worm thread is drawn through the lower pole of the testicle and tunica vaginalis, and after forming a hollow in the scrotum with the tip of the finger, the ends of the thread are passed into long curved needles, which latter are made to pierce the base of the scrotum a distance of 5 mm. With this strong thread it is easy to pull the testicle down into the scrotum; the ends are tied over a gauze roll, threads being left long; a plaster of Paris cast is applied firmly to the respective extremity, starting at the external malleolus surrounding the plantar pedis, and extending above the upper and inner third of the thigh. A hole is cut into the upper end of the cast, through which one of the ends of the thread is passed, and then the two ends are firmly tied. Thus, retraction of the testicle is rendered impossible. After seven days, at the end of which time the elasticity of the cord has yielded sufficiently and the testicle has become thoroughly fixed in its new place, the cast and thread are removed.

Fischer states that from October, 1911, to October, 1912, he did 14 transplantations of the testicle in ten patients. Of these, 13 were inguinal, 1 a perineal ectopia. Of the former, 1 was internal, 4 interstitial, and 8 external; 4 of these were operated upon with simple fixation of the testicle in the scrotum, with no better results than those reported by other surgeons. In the remaining 9 cases, in which the above described procedure was employed, complete success was obtained in each instance.

I believe that in most cases the cord can be sufficiently freed and elongated to allow its testes to remain in the scrotum without artificial

<sup>1</sup> Beit. z. klin. Chir., 1913, Band 84, Heft 1.

aid. In cases that this cannot be done, the method proposed by Fischer is doubtless a very good one.

A simpler method of attaching two broad strips of adhesive plaster to the thigh to which the thread may be tied, would accomplish the same result.

**THE CONSERVATIVE TREATMENT OF UNDESCENDED TESTICLE.** McGlannan, of Baltimore, in a paper read before the Southern Surgical Association in Atlanta, Georgia, and published in the *Journal of the American Medical Association*, February 28, 1914, states:

"Although more than thirty years have passed since Schüller described his operation for bringing the undescended testicle into the scrotum, and although in this time many other observers have reported series of cases and personal experiences, many surgeons still doubt the practicability of the operation and in dealing with this condition advise excision of the undescended testicle as the operation of choice."

McGlannan attempts to answer two very important questions:

1. Is the non-descended testicle worth saving?
2. Is it technically possible to bring such a testicle into the scrotum in a manner that will preserve its vitality?

He states that the opinion so generally held by the older writers, that malignant changes are much more likely to occur in the undescended testicle than the normal testicle, was one reason why it was so frequently removed. Later studies, however, have shown the frequency of malignant disease in the undescended testicle to be much less than formerly was supposed.

In a paper read before the Southern Surgical Association December 16, 1914, on "Sarcoma of the Undescended Testicle" (not yet published), I have taken up the question of the relative frequency of malignant disease in the normal and undescended testicle. Further experience has forced me to change my earlier opinion, that malignant disease was no more common in the undescended than the normally descending testicle, as shown by the statistics already quoted.

I do not regard this tendency to malignant degeneration sufficient ground, however, to cause the surgeon to excise the testicle in operations for undescended testicle, except in extremely rare instances. In cases of abdominal ectopia in which the testicle cannot be brought down into the scrotum, *e. g.*, I believe it wiser to sacrifice the organ than to replace it in the abdominal cavity, provided always that the patient's other testicle is normally descended.

The question as to whether the undescended testicle is ever of functional value, has long been a disputed point. Rawling,<sup>1</sup> in his important paper, advocated excision of the testicle as the operation of choice, basing his conclusion on a study of 120 cases, observed at St. Bartholomew's Hospital.

<sup>1</sup> London Practitioner, August, 1908.



While I strongly dissent from this opinion, the fact that excision was performed in such a large number of cases at this hospital, gave an unusual opportunity for histological investigations. A study of these testicles removed showed a very large proportion of them to have retained their functional value. McGlannan gives further evidence in proof of this. He states that of the specimens which he has examined, spermatogenesis was observed in 3 of the 7 cases in which the testicle was removed from young adults, the proportion being about the same as that reported by Odiorne and Simmons, who found adult spermatozoa in 4 of 9 testicles examined. In the remaining cases the histological picture resembled the infantile type of testicle four times, and the senile testicle twice. McGlannan's paper is based upon a study of 16 cases which he personally operated upon within the past seven years. All the cases were associated with hernia, confirming the opinion that I have expressed several years ago, that undescended testis is almost uniformly associated with hernia. The operation performed by McGlannan is practically the one advocated by Bevan, which I believe to be the best that has yet been described. McGlannan divided the spermatic vessels four times. Four of his cases were bilateral, 3 left, and 9 right-sided single. Three of the 4 bilateral cases have been carefully traced. One is of very great interest. This patient was thirty years of age at the time of operation; both testicles were in the abdomen and were complicated by hernias. Both were brought into the scrotum after division of the spermatic vessels. Eighteen months later the patient became the father of a child.

This proves the incorrectness of the opinion generally held, that abdominal ectopia means absence of spermatogenesis. The other 2 cases of bilateral ectopia are of interest: both were twelve years old at the time of operation; both were quite undeveloped and showed absence of pubic hair and other secondary sexual characteristics. Both have since developed these characteristics.

I agree with Dr. McGlannan, that an operation should seldom be performed under the age of ten years, unless difficulty in controlling the hernia furnishes the indication for operation.

Personally, I have observed 65 cases of cancer of the testis, in which 12 occurred in the undescended testis. This corresponds very closely with other statistics, and shows beyond any reasonable doubt that the relative frequency of malignant disease is considerably greater in the undescended than in the normal testis.

Esau<sup>1</sup> reports in detail a case of true incarcerated, dystopic, inguino-inguinal hernia (inguino-superficial hernia), observed in a man, aged twenty-one years. He believes that he undoubtedly had to deal with a congenital inguinal ectopic testicle with patent vaginal process, which,

<sup>1</sup> Arch. f. Klin. Chir., 1913, Band 102, Heft 2.

after reaching considerable size, formed a dystopic hernial sac. A loop of small intestine entered the sac and incarceration resulted. The latter condition was aggravated by the fact that the patient vomited repeatedly at the start of the symptoms. The accompanying sketches show the peculiarities of the case. The patient made a good recovery.

Esau calls attention to the mushroom shape of the sac in his case, in contradistinction to the pear-shaped sac usually found in these cases (see Figs. 9 and 10). The anterior surface of both the sac and neck

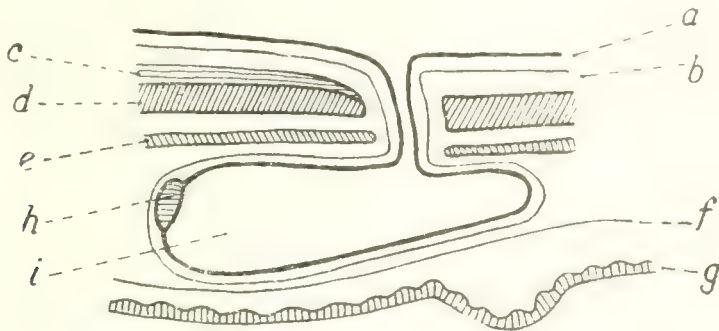


FIG. 9

was absolutely smooth. On the other hand, there were firm adhesions between the sac and external ring. There was material shortening of the vaginal process, and the testicle could be easily drawn into the scrotum. The patient made an uninterrupted recovery except that the scrotal wound in the perineum healed by secondary intention.

As regards the cause of dystopia of the vaginal process, Esau states that Büdinger ascribes the condition principally to the following two factors:

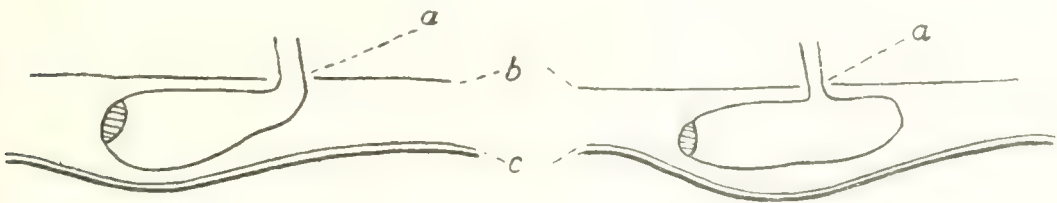


FIG. 10

Primary disturbance in the descent of the vaginal process, and scar formation from fetal peritonitis in the neighborhood of the vaginal process, or of the process itself.

Esau states that the chances of seeing true, dystopic hernia, either free, or incarcerated, will no doubt decrease as time passes, inasmuch as orchidopexy is nowadays generally done at an early period, and, hence, there will be no opportunity for the transformation of a vaginal process into a dystopic sac.

Before publishing the above described case, Esau had occasion to



operate upon a second case of dystopic inguinal hernia, with omentum as reducible contents of the sac, in a boy, sixteen years of age. The absence of the right testicle had been noticed at birth. After isolation of the sac, and division of the external aponeurosis, the former was opened and considerable omentum found, which, while not adherent to the sac at any point, showed numerous scars and adhesions; resection of part of the omentum was performed. The testicle lay free within the sac, the epididymis about 1 cm. distant from the sac. Near the neck the otherwise very delicate sac showed radiating scar formation of slight thickness. Extirpation of the sac outside of the vas deferens, was done and the cord loosened within the hernial opening, which later admitted the small finger; the neck of the sac was closed as in the typical Bassini operation; the testicle could be easily brought into the upper third of the scrotum so that no further anchoring was deemed necessary.

**Etiology of Hernia.** Bernstein<sup>1</sup> presents a valuable contribution to the question of the etiology of hernia which is of greatest interest in connection with accident insurance systems. He refers to the exhaustive work of Wernher<sup>2</sup> and reiterates the latter's clear and concise resumé of the various theories advanced regarding the mechanism of hernia.

Bernstein's own investigations extend over a period of two years, and cover material of 279 cadavers, external examinations only being made. He found 82 cases, or 25.8 per cent., afflicted either with an actual or potential hernia. Of these, 51 were males, 21 females. Of the male cases, 16, or 5.7 per cent. had but one hernia, while 35, or 12.6 per cent., showed several actual or potential herniæ. Of the female cases, only 2, or 0.7 per cent., had a single hernia, while 19, or 6.7 per cent., showed several herniæ or conditions favoring the development of such. The total showed single affection in 18 cases, or 6.4 per cent.; multiple affection in 54, or 19.4 per cent.

The average age of the cadavers examined was about fifty-five years.

Bernstein's examinations showed that while the relative frequency of hernia in the male and female is as  $2\frac{3}{4}$  to 1, the proportion of multiple to single herniæ in the male is  $2\frac{1}{2}$  to 1; in the female,  $9\frac{1}{2}$  to 1. That the formation of the female pelvis plays an important role in this connection he believes is shown by the fact that in but one of the 51 male cadavers was the obturator foramen sufficiently large to admit the forefinger, against two in the female in a series of 21 cases.

Bernstein's investigations in the 72 cadavers with actual or potential hernia, showed 135 anatomically changed hernial openings, *i. e.*, nearly every cadaver had two abnormal hernial openings. Of these 135 openings, 21 were with contents, 114 empty, or a proportion of filled to empty openings of 1 to 5.4 per cent. (He found only 6 cases with lipomas, namely, 4 males with 2 each, and 2 females with 1 each.)

<sup>1</sup> Arch. f. klin. Chir., 1913, Band 100, Heft 4.

<sup>2</sup> Ibid., 1872, Band 14.

Bernstein states that not infrequently he found 3 to 4 abnormal hernial openings in one individual. This, he believes, shows that there must be an anatomical predisposition for the formation of a hernia, which can be attributed only to prenatal processes.

Believing that the examination of cadavers *after* fetal life, was not sufficient to definitely prove that hernia is due to congenital anatomical predisposing factors, Bernstein,<sup>1</sup> after the publication of the above paper, started further investigations upon the cadavers of feti and newborn infants.

In a series of 99 cases, he found 17 with actual or potential hernia. Two of these were feti (fifth to tenth month of pregnancy); 2 newly born infants; 2 children less than a year and 1 one-half year of age.

Eleven of the cases were males, 7 with multiple herniæ or hernial predisposition; 4 with single actual or potential hernia. Six were females, 4 with single, 2 with multiple actual or potential hernia, or a total of 8 single and 9 multiple affections.

Sixteen of the 17 cases showed empty, distended hernial openings, *i. e.*, none of the 16 cases had a real hernia, but merely conditions favoring the development of a hernia. The seventeenth case was a hernia of the umbilical cord, which Bernstein believes should really be separately accounted for and probably be added to the 173 cases of congenital hernia funiculi umbilicalis recently collected by Usener.

Bernstein's comparative table of his findings in adults and feti is of interest:

	Adults, per cent.	Feti, per cent.
Total number of cases with hernia or predisposition to such . . . . .	25.8	17.1
Males . . . . .	18.3	11.1
Females . . . . .	7.4	6.0
Males, single affection . . . . .	5.7	4.0
Males, multiple . . . . .	12.6	7.1
Females, single . . . . .	0.7	4.0
Females, multiple . . . . .	6.7	2.0
Total single . . . . .	6.4	8.1
Total multiple . . . . .	19.4	9.1

To explain the disparity between the number of herniæ found in the adult and fetal cases, Bernstein states that, in examining the latter, the internal inguinal fossa was excluded, only the cases in which also the median or supravesical inguinal fossa showed a depression having been taken into consideration. Including all the fossæ, he found 27.2 per cent. in the feti.

The reason for this exclusion of the internal fossa was that the point at issue is the question of the normal obliteration of the vaginal process.

<sup>1</sup> Arch. f. klin. Chir., 1914, Band 103, Heft 3.



Hence, if the autopsy showed depression of the lateral inguinal fovea and a dilated inguinal canal with a patent vaginal process before the time of its normal obliteration, the case could not be used for the purpose in question, inasmuch as with progressive obliteration normal conditions might result.

As to the exact time when the normal obliteration of the vaginal process occurs, Bernstein states that the literature contains but few and widely differing statements. Engel, in 1857, stated that the vaginal process is seldom obliterated at birth; obliterations seem to occur during the first year of life. And for this reason he excluded all cases with an open vaginal process.

Bernstein emphasizes the fact that in all of the fetal cases (excepting only the umbilical hernia) with 33 preformed sacs the latter were empty. In other words, there were no fetal herniæ, but only preformed sacs (conditions favoring their development), and that there were more than 2 for each fetus.

Bernstein believes that these investigations have shown that herniæ are due to congenital anatomical predisposition. Although practical experience seems to speak in favor of heredity in hernia, theoretically this question has not been proven by his examinations.

These investigations confirm the opinion frequently expressed in PROGRESSIVE MEDICINE.

"Sliding Hernia and Exceptionally Large Inguinal Hernia" is the subject of a paper by Schulz,<sup>1</sup> of the Urban Hospital, Berlin (Prof. Brentano). As to exceptionally large herniæ, he states that the results with reference to mortality and permanent cure are most unfavorable. Of 286 abdominal herniæ operated upon at the Urban Hospital up to March 1, 1912, only 14 were extra large herniæ. To these Schulz adds two of Brentano's private cases, making a total of 16, 10 of which were associated with a sliding hernia. He states that comparatively few cases of this type are reported in the literature.

On the basis of studies upon the cadaver, Schulz has become convinced that (after splitting of the lateral rectus sheath) the elasticity of the abdominal coverings is entirely sufficient to insure a satisfactory closure of even the largest hernial opening. He adds that the theoretical results in the cadaver have been confirmed by practical experience. Even in one case in which the hernial opening occupied almost the entire inguinal ligament up to the superior anterior iliac spine, firm union of the lateral border of the split anterior rectus sheath with the inguinal band, was obtained, and hence the result was satisfactory.

Reviewing the experience had at the Urban Clinic with operations for extra large herniæ with or without the large intestine as contents, Schulz states as follows:

<sup>1</sup>Arch. f. klin. Chir., 1912, Band 98, Heft 2.

1. Radical operation may be unreservedly advised in all cases of exceptionally large herniæ, provided the patients are not too old, or afflicted with some serious chronic disease.

2. Of the greatest importance in the preparation of these patients is a thorough evacuation of the bowel. Such remedies as elastic bandaging, raising of the foot-end of the patient's bed, are of little value. By careful attempts at reduction, the abdomen should be made gradually accustomed to greater contents.

3. Closure of even the largest hernial openings can be obtained by means of Bassini's operation, provided the tendinous parts used for the posterior part of the suture are duly mobilized by means of splitting the rectus sheath.

4. Reduction of the hernial contents is facilitated by placing the patient in an extreme Trendelenburg posture during the operation.

5. To further insure a good result in cases of large hernia of long standing, it is advisable to remove the testicle with the cord. In young patients with well-preserved testicle, the latter may be transplanted into the abdomen.

6. In sliding hernia it is best to partially remove the sac, suturing the rest over the intestine, which is then replaced in the abdomen.

7. A complete removal of the sac from the scrotum should be aimed at. This can usually be accomplished by blunt dissection. The scrotal half, which at first, after removal of the sac, contracts, later expands again, sometimes giving rise to hemorrhages. A brief drainage of the scrotum is therefore indicated. Everything possible should be done to prevent collection of blood, which, in view of the difficulty in disinfecting the skin of the scrotum, might easily cause suppuration.

8. To further secure the suture, a periosteal flap, according to Fritz Koenig, may be used.

9. Very large herniæ, bilateral, should be operated upon in two sittings.

10. Excisions out of the distended skin of the scrotum are unnecessary.

I agree with the author in most of his conclusions but would take exception to the one in which he urges removal of the testis with the cord, except in young patients, in which latter he advocates transplanting the testis into the abdomen. There are practically no cases of hernia, excluding those associated with abdominal ectopia, in which it is necessary, or wise, to remove the testicle. If Bassini's technique is carefully carried out, the testicle can be retained without materially lessening the chances of a cure. In my opinion, it is never wise to transplant the testis into the abdomen.

The treatment of large herniæ is a very important subject and one regarding which there is much difference of opinion. It has been very admirably treated by Barker<sup>1</sup> of the University College Hospital of London.

<sup>1</sup> *Lancet*, April 12, 1913, p. 1011.



Mr. Barker states, "It is surprising how many middle-aged individuals of both sexes are going about with very large herniæ in various situations under the impression that they are beyond the reach of cure." The treatment of such herniæ by truss or belt he believes eminently unsatisfactory. In the absence of any contra-indications, such as chronic bronchitis, albuminuria, arteriosclerosis and glycosuria, he believes the majority of such cases can be satisfactorily treated by operation. He emphasizes one very important point, namely, that unless these individuals are relieved of their herniæ, they are constantly subjected to serious risks, particularly from incarceration and strangulation, but that in deciding upon operative treatment, these risks must be carefully balanced against the risks of operation. He describes several successful operations of very desperate cases.

In regard to the factor supposed to contra-indicate operation (the size of the hernia), he states that the hernia may be so huge that the abdominal cavity has not sufficient room to contain it if reduced.

I have personally seen one such case in which the reduction of the hernia caused such increase in intra-abdominal tension that it greatly interfered with the movements of the diaphragm which was undoubtedly chiefly responsible for the fatal result.

Barker lays down a very important rule in the treatment of these hernias of very large size, namely, that the patient should be put to bed for some weeks before operation on a strict diet to reduce the amount of fat and fluid in the tissues, associated with daily attempts to reduce the hernia into the abdominal cavity. If the mass can be reduced without causing serious difficulty in respiration, there is reason to believe that the operation may prove successful. Acute bronchitis, marked albuminuria or much sugar in the urine, he believes to be contra-indications, unless the need for operation is urgent.

As regards the age of the patient, he thinks this question must be determined in the individual case, and not by a general rule, inasmuch as some patients at fifty are older than others at seventy, as regards their ability to stand a surgical operation. An unusual amount of adipose tissue of itself is not a contra-indication if the general health of the patient is good, but the pasty, flabby, anemic corpulence, he thinks, should cause one to hesitate in operating.

With reference to the methods of operation, he considers the preparations of the patient the most important part of any procedure. A rest in bed for a considerable period has the additional advantage of making it possible to thoroughly clean the skin over the entire field of operation by daily washing with hot water, often with an astringent antiseptic lotion.

With regard to the anesthetic, he believes that a local anesthetic is the safest, and he uses it frequently. Inhalation anesthesia, if combined with preliminary injection of atropine, has advantages, especially

if the operation is protracted, but its disadvantages are that it has the tendency to produce coughing and straining.

Spinal analgesia, he states, if well carried out, gives ideal conditions for the operator, and, although it has dangers, the full extent of which are not yet known, it is superior to other methods of anesthesia in many ways. He states that he has now used it in some hundreds of hernia operations without fatality and it has certainly facilitated the accurate performance of them to a degree that no other anesthetic could do. The absence of rigidity of the muscles and of all respiratory excitement during and after operation renders the procedure very easy. Then the patient can take nourishment within a few hours, and this is of great importance, especially in elderly people.

In all cases purgatives are used prior to operation; it is important, however, that they be stopped forty-eight hours before.

As to the various methods of operation proposed for these herniæ, he regards the Bassini operation, carried out with every attention to detail, as by far the best method for the inguinal variety of hernia. He calls attention to the tendency of the formation of a hematoma of the scrotum from engorgement of the veins, which favors oozing.

In regard to the use of silver wire filigrees inserted deeply in inguinal herniæ to add strength to the abdominal wall, he believes that in the large majority of cases they are unnecessary. With this opinion I very strongly concur. In the large ventral and umbilical herniæ, he believes they are often of the greatest value, not only because they give a certain amount of support for a time, but because their presence in the tissues provokes an exudation of lymph without sepsis, which organizes into particularly firm fibrous tissue.

He cites a very conclusive case of a man, the greater part of whose left rectus had been removed three years before, for a fungating carcinoma of the transverse colon. As there was nothing to replace the muscle, he used a silver filigree, over which the skin was drawn. He states that at present, three years later, there is no hernia, though the scar is very thin, thin enough to be moved by the intestine underneath it. He believes that the use of these filigrees is, as a rule, required only in very obese people with one or other form of ventral hernia, the rings of which are loose and so thin that there is but little material to work upon. He is of the opinion that none of the ingenious plastic operations that have been devised are as rational or as feasible as this filigree.

As to the objections that have been freely brought against the use of the wire mesh, he believes the one most justifiable is, that the wire will break up in time and the small broken ends cause irritation. He believes that this will occur only in cases in which too thick wire has been employed, but when very fine wire is used, this risk may be avoided. Another serious objection is that suppuration occurs and the wire must be taken out, which is a matter of a great deal of difficulty and is usually



followed by a rapid recurrence of the hernia. He states, however, that this need not be done. He has planted filigrees in wounds actually suppurating, and far from their keeping up the inflammation, they have even appeared to control it. He states that some scores of his cases have been going about for years with these filigrees in their scars, and, from what he has seen of them, he is sure, to their benefit.

While I do not agree with Dr. Barker as to the wisdom of using silver wire filigree, except in extreme cases, we must admit that the evidence he has presented of their value, is strong. It is just these cases that he describes, traced for a considerable period of years, which enable us in time to arrive at a correct opinion of the value of this method. Previous writing on the subject have been seriously lacking in such data.

Very important statistics as regards THE DECREASE IN THE NUMBER OF PATIENTS RECEIVING MECHANICAL TREATMENT FOR HERNIA is brought out by Roberts<sup>1</sup> of the City of London Truss Society, *viz.*:

Age.	1893.	1912.	Decrease, per cent.
Under 1	492	133	72.9
1 to 10	1085	484	55.3
11 to 20	578	233	59.5
21 to 30	1145	489	57.2
31 to 40	1558	1028	33.3
41 to 50	1798	1504	16.3
51 to 60	1630	1479	9.2
61 to 70	1146	1063	7.2
71 to 80	424	386	8.9
81 to 90	36	40	11.1 increase.

Roberts states that this diminution dates from 1895, *i. e.*, about the time from which dates the increasing frequency of operation. At St. Bartholomew's Hospital the operation for the radical cure of inguinal and femoral hernia in 1893 numbered 118, against 357 in 1911, a similar increase occurring at all other hospitals.

I believe that Roberts' interpretation of this decrease in the number of patients applying for treatment at the London Truss Society is correct. We have noticed the same steady diminution in the number of cases observed at the Hospital for Ruptured and Crippled during the last twenty years. I believe this is an undoubted evidence of the efficiency of the modern operation for the radical cure of hernia.

Eustace and McNealy<sup>2</sup> report a case of STRANGULATED TUBO-OVARIAN HERNIA in an infant six months of age. The hernia had been noticed from birth, had been reducible until three days before operation. During these three days the swelling had noticeably increased in size

<sup>1</sup> Lancet, November 22, 1913.

<sup>2</sup> Journal of American Medical Association, March 7, 1914.

and showed evidence of inflammation, accompanied by some nausea and vomiting, with scant bowel movements.

The sac contained two drams of bloody fluid, tube, ovary and broad ligament; there was a torsion of the tube and ovary of 180°.

The authors refer to the paper of Heineck, who collected 80 cases of this type, 35 of which occurred in infants under one year of age, with 2 fatalities.

**Obturator Herniæ.** Wagner<sup>1</sup> states that little more than 200 cases of obturator hernia are described in the entire literature. The mortality of this form of hernia is high; according to Rose it is 78.7 per cent.; Graser gives it at 79 per cent.

There is no unanimity of opinion as to the best method of operation, whether herniotomy, laparotomy or both should be done and the textbooks bring little or nothing on the subject.

Wagner reports a personal case, recently operated upon at the General Hospital in Lubeck, which he believes unique.

The patient, a greatly reduced woman of seventy-two, was admitted to the hospital on March 2, 1914. She claimed to have had stomach trouble with intermittent vomiting for the last twenty years, had subsisted almost entirely on fluid diet during the last ten years. She has been treated all along for stomach disease and gall-stones. She states that since the birth of her first child there has existed a hernia in the right crural region. She was suddenly taken sick two days previously with intense abdominal pain and vomiting which finally became fecal; she could not pass any water. She was admitted to the hospital on a diagnosis of ileus and anuria. Examination revealed a tense, tender tumor, the size of an apple, near the right crural opening. The diagnosis of crural, possibly obturator, hernia was made.

*Operation.* Herniotomy under local anesthesia, followed by laparotomy (under ether) in the median line below the umbilicus. Longitudinal incision over the tumor. The fibers of the weak pectineus muscle had to be divided before the sac could be reached.

On opening the latter, a large amount of turbid, bluish, not offensive fluid escaped and a bluish-black loop of small intestine, plus tube and ovary of the same color, came into view. The hernial opening was so narrow that reposition was out of question. The customary incision of the ring was considered too dangerous, nor was it thought wise to remove the pubic bone. Hence, the abdomen was opened in the median line and a strip of omentum adherent to a loop of small intestine was seen to pass toward the obturator canal; the strip loosened and ligated; a narrow, slot-like opening was felt in the foramen obturatorium, the elastic borders of which strangulated the hernial contents. After careful, blunt dilatation of this opening, the strangulated loop of small

<sup>1</sup> Deutsch Zeitschr. f. Chir., September, 1914.



intestine, about 10 cm. in length, could be replaced in the abdomen. Owing to an occlusion of the gut near the distal constricting ring, an entero-anastomosis became necessary. However, in view of the patient's weak condition, resection was not done; the two loops were merely sutured together, so that no gut could pass between them. The greater part of the sac was amputated, the remaining portion being pulled together by means of a silk thread, however not high up, as is usually done, but lower down, in order to retain sufficient material. The sac remnant thus drawn together was then pushed through the canal and sutured broadly to the parietal peritoneum.

On the eighth day after operation, during a severe coughing spell, the laparotomy cicatrix burst open and had to be resutured. Nevertheless, the patient recovered and left the hospital cured on March 31.

Wagner believes that the bad prognosis of obturator hernia is due to the fact that the patients usually are decrepit old women. He states that only 2 cases of recurrence after operation for obturator hernia are recorded. The operative mortality is as yet 40 to 50 per cent.

Wagner concludes that the high mortality can be reduced only by greater efficiency in rendering the diagnosis and prompt operative intervention. Taxis, he states, should never be attempted, especially in view of the danger of a sham reduction being accomplished.

The operative methods to be considered are (1) herniotomy; (2) laparotomy; (3) a combination of both. There is no one procedure that may be employed in all cases. Laparotomy is the method of choice in all doubtful cases in which there is no tumor visible externally. In all other cases, herniotomy under local anesthesia should be the first step; laparotomy, if deemed necessary, is best and most quickly done in the median line.

Radical operation of obturator hernia by the abdominal route is to be done by means of a bone flap of periosteum, according to Bardenheuer; extra-peritoneally, it is best done by means of a pedunculated muscle flap from the crest muscle. In cases demanding speed, when operated upon by the abdominal route, the hernial opening may be closed by silk sutures. When using the combined method, closure of the internal foramen obturatorium may be obtained by means of the hernial sac.

I have never seen a case of obturator hernia nor has one been observed at the Hospital for Ruptured and Crippled.

To Graser's statement, before the Surgical Congress in 1909, that there was certainly nothing to boast of regarding the therapy of INCARCERATED OBTURATOR HERNIA, the mortality being about 50 per cent., Erich Meyer,<sup>1</sup> in his paper on this subject replies that the literature covering the years from 1875 to 1885 shows as large a number of cures

<sup>1</sup> Arch. f. klin. Chir., 1911, Band 103, Heft 2.

as had been reported in the entire one hundred and fifty preceding years, *i. e.*, since 1720, when this type of hernia was first described by Arnaud de Ronsil.

Meyer states that Fischer distinguishes four types of obturator hernia, according to the direction the hernia takes after leaving the obturator canal, namely:

1. The hernia traverses the canal and appears in front of it.
2. The hernia, following the branch of the lower obturator artery, passes outward between the upper and middle thirds of the obturator muscle.
3. The hernia remains between the external sheath of the obturator membrane and the internal obturator muscle, pushing the latter along with it.
4. The hernia appears in the very narrow interspace between the obturator membrane and the border of the acetabulum.

The location of the vessels is such that in the first two instances the sac lies in front of the vessels and the nerve, while in the latter two instances the vessels cover the hernial sac (although one case has been published in which the hernia had found its way between the two).

Meyer states that the diagnosis of free obturator hernia before operation seems hardly possible, while that of incarcerated obturator hernia is extremely doubtful. In most cases the hernia is detected only on operation or at autopsy. Meyer points out the advantages of laparotomy over herniotomy, although he admits that the cures of the former—showing 56 per cent. against 50 for the latter—do not speak very strongly in favor of laparotomy. As, however, obturator herniæ are apt to recur (6 of 56 cases, or 10.71 per cent.), some operators have of late advocated closure of the hernial opening (which cannot be accomplished by simple suture) either by osteoplasty or by occluding the obturator membrane by means of the severed pectineal muscle. Meyer reports 6 cases of obturator hernia operated upon at St. Jacob's Hospital, Leipzig, since 1875; 5 by Trendelenburg, 1 by Payr. All of the cases were female, and their ages ranged from fifty to eighty-two years. This is not exceptional, inasmuch as all but four of the entire 56 cases collected by Meyer were women, giving a percentage of 92.85. Previous statistics show the following proportion of the sexes: Berger, 118 cases, with 18 males, or 15.75 per cent.; Pimpet, 73 cases, with 8 males, or 12.3 per cent.; Thiele, 26 cases, with 2 males, or 7.76 per cent.

Of 51 cases reported since 1875, the hernia occurred on the right side in 16, or 31.37 per cent., on the left side in 32 cases, or 60.78 per cent., and on both sides, in 4, or 7.84 per cent.

CONGENITAL OBTURATOR HERNIA has never been observed, nor does obturator hernia occur in children. Of 51 cases, 40, or 78.82 per cent., of patients were over sixty years of age.



Of the 56 cases collected by Meyer, 24, or 42.85 per cent. were cured; 32, or 57.15 per cent., died. Comparing these results with those of the earlier statistics of Graser who collected 178 cases, reported between 1720 and 1890, with 93, or 78.81 per cent., deaths, Meyer states, we have a decrease in the mortality of 21.66 per cent.

Englisch reported 22 *herniotomies* for obturator hernia with 9 cures, or 40.91 per cent. v. Meer, 21 *laparotomies* with 9 cures, or 42.85 per cent.

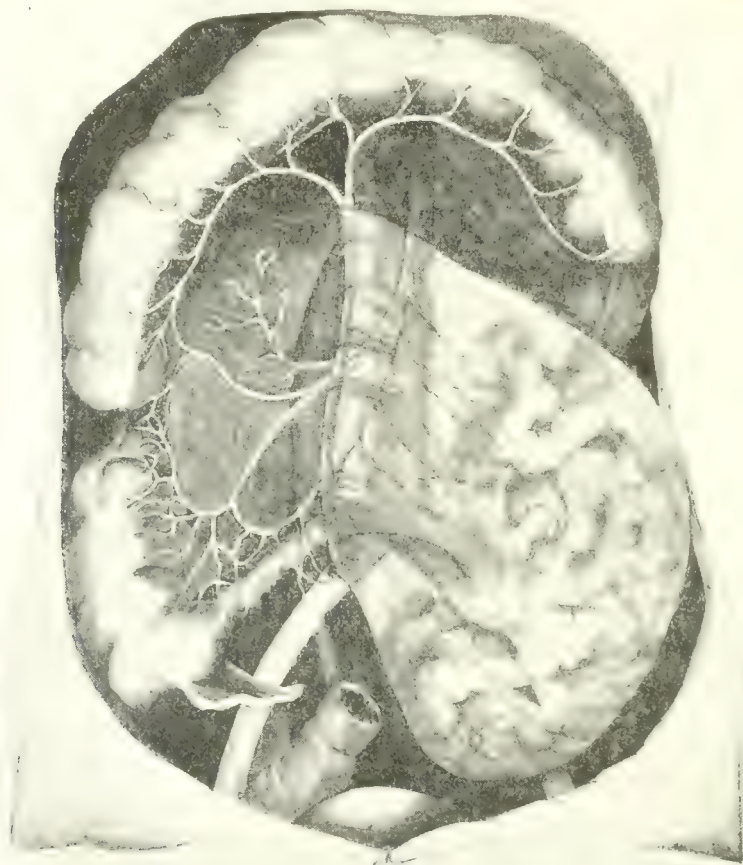


FIG. 11.—Retroperitoneal hernia due to an aberrant middle colic artery. The artist has represented the sac as if it were transparent in order to indicate its relation, as described in the text.

The *prognosis* of incarcerated obturator hernia must always be considered extremely doubtful. On the other hand, the literature contains reports of 3 cases of unknown incarcerated obturator hernia, which caused the patient no trouble whatever.

Meyer states that a recurrence after successful operation is to be expected in 25 per cent. of the cases of obturator hernia.

With regard to the etiology, opinions differ widely; while most authors regard the anatomical formation of the female pelvis as the principal cause of this form of a hernia, Meyer states, there is as yet no generally accepted theory as to the origin of obturator hernia.

Primrose,<sup>1</sup> before the meeting of the Surgical Section of the American Medical Association, in June, 1914, reports a very rare case of retro-

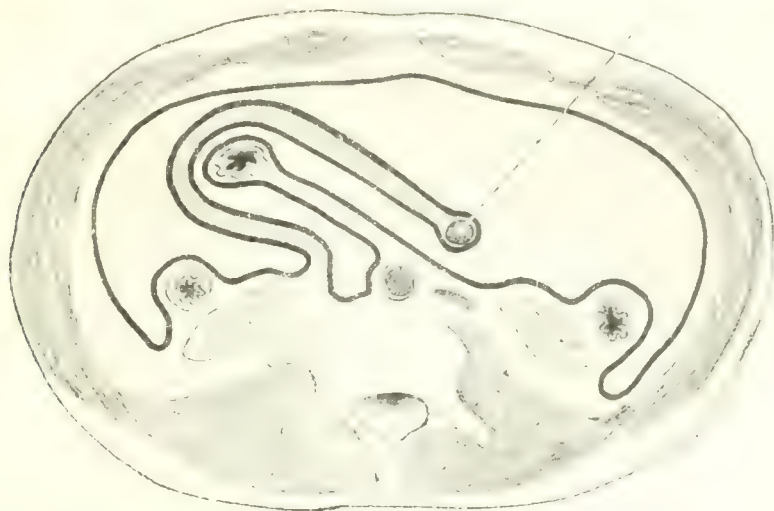


FIG. 12.—Retroperitoneal hernia due to an aberrant middle colic artery (indicated by the arrow). Diagrammatic representation of a transverse section illustrating the relations of the folds of the peritoneum forming the sac.

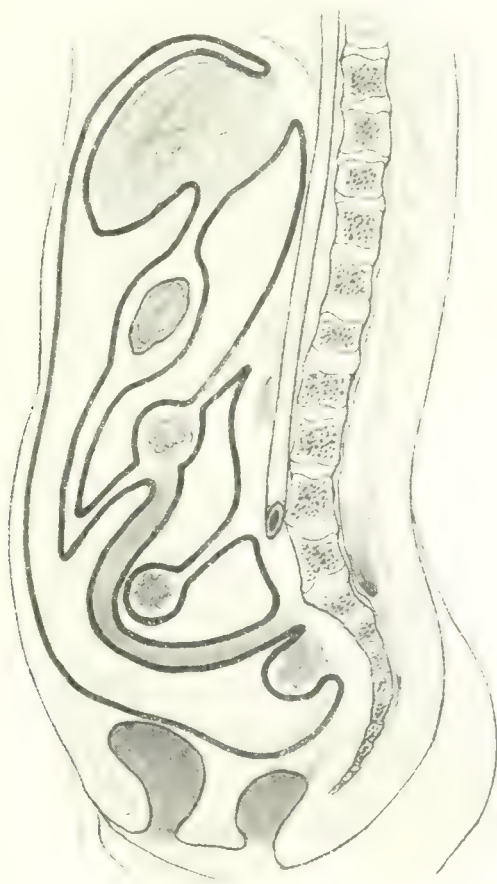


FIG. 13.—Retroperitoneal hernia due to an aberrant middle colic artery. A diagrammatic representation of a sagittal section illustrating the relations of the folds of peritoneum forming the sac.

<sup>1</sup> Journal of American Medical Association, September 5, 1914.



peritoneal hernia, due to an aberrant middle colic artery. The history of the case is briefly as follows:

Male, aged sixty years, complained of epigastric pain for three years, coming on usually a few hours after eating. Eighteen months prior to operation he had a severe attack of hemorrhage. There was loss of weight and excessive acidity. Palpation showed a tumor immediately to the left of the umbilicus which seemed to be incorporated in the left rectus muscle; it was about the size of a large lemon. A diagnosis was made of gastric ulcer with cicatricial contraction producing an hour-glass stomach. In the course of the operation done for gastric ulcer, a remarkable condition of internal hernia was discovered, the entire small intestine being contained in the sac. When the abdomen was first opened, no small intestine was visible, but a large, flabby sac extending deep down into the pelvis, was found in the lumbar region. The opening of the sac lay immediately to the right of the middle line and was bounded anteriorly on its free margin by a structure which extended from the brim of the pelvis upward toward the transverse colon. On picking up the structure it was found to pulsate and thus it became evident that a large artery formed the margin of the opening. It was ascertained that the blood current was from below upward and that the artery arose from the right common iliac. Further examination showed it to be an aberrant middle colic artery. It was seen that, with the exception of about 2 inches of the lower end of the ileum which passed out to join the cecum, the entire small intestine was contained in the peritoneal sac. In view of the fact that the patient had evidently had this hernia for the greater part of his life, without inconvenience, and further, because of the fact that it did not seem possible to efficiently obliterate the sac, it was determined to leave matters as they were. The patient made an excellent recovery from his stomach trouble, and was well at the time of the report, six months later.

# SURGERY OF THE ABDOMEN, EXCLUSIVE OF HERNIA.

BY JOHN C. A. GERSTER, M.D.

**A New Method of Examining the Alimentary Tract** was brought out by Payr at the German Surgical Congress, in 1914. Instead of using barium or bismuth salts, Payr gives the patient a suspension of finely divided iron particles, either (1) ferrum reductum or (2) ferrum oxydulatum,  $\text{Fe}_3\text{O}_4$ , or (3) the natural magnetic iron ("Magneteisen"). He prefers

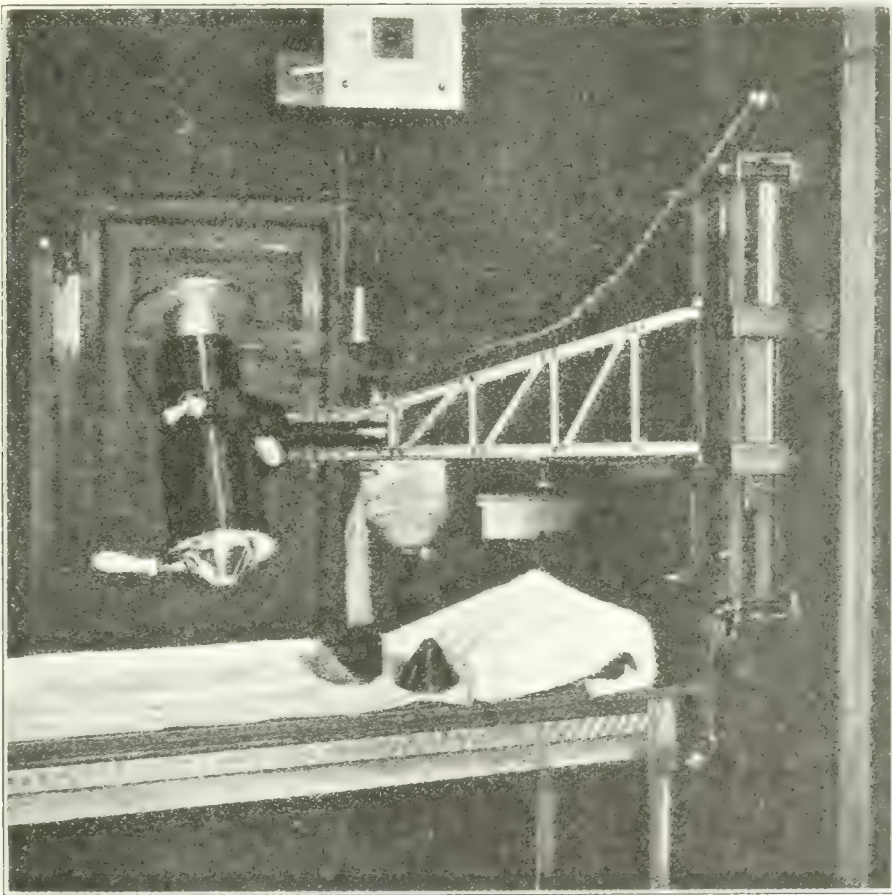


FIG. 14.—Magnet for examination of gastro-intestinal tract after ingestion of finely divided iron particles. (Payr.)

the second of the three. By means of a suitably suspended and controlled magnet (Fig. 14) the iron-filled organ is caused to move; 6 to 12 ampères produce sufficient magnetic effect. For examination of the stomach, 60 to 80 grams of  $\text{Fe}_3\text{O}_4$  are given in cocoa. For examination of the large intestine, Payr uses an enema composed of ferrum oxydulatum



300 to 400 grams, bismuth carbonate 70, bolus alba 150, and water to 1000. One liter of this is sufficient. By fluoroscope the course of the contrast material is followed until it has reached a spot where a previously placed marker indicates the region to be examined. One hand of the operator is now placed between the magnet and the abdominal wall of the patient as a control; the current is then turned on and the magnetic force is exerted. In this way one not only can feel, but also see, the various portions of the intestinal canal raising up the anterior abdominal wall



FIG. 15.—Visible and palpable raising of the large intestine which has been filled with a suspension of iron. (Payr.)

(Fig. 15). A simultaneous observation with the fluoroscope may conveniently be carried out at such a time. The magnetic field causes a moderate weakening of the cathode rays. By employing a suitable technique this can be circumvented.

The method is so recent that there has been no time for the discovery of its limitations, advantages, and disadvantages. By using pills of iron and bismuth, the outline of a hollow cavity might be demonstrated with a fair amount of success if the magnetic force were so applied as to draw the iron pills against the upper wall while the bismuth pills lie quietly in the bottom of the cavity. If in the presence of fluid, the floating bismuth pills of Kaestle might also be of value.

**Oxygen Inflation of the Peritoneal Cavity to Facilitate X-ray Pictures of the Liver, Spleen, and Diaphragm.** Rautenberg<sup>1</sup> noticed in x-ray pictures of the upper abdomen of patients with ascites, that the liver was much more clearly outlined than usual. He accordingly hit upon the idea of using a harmless absorbable gas instead of fluid to accomplish the same effect, and introduced from 3 to 6 liters of oxygen through a puncture in the peritoneum. Remarkably clear pictures of the liver, spleen, and curve of the diaphragm were obtained in this way.

**Paravertebral Anesthesia in Abdominal Surgery.** Jurasz<sup>2</sup> ascribes the collapse observed after paravertebral anesthesia, by Kappis and Franke, to the use of too strongly concentrated solutions in people who have a certain intolerance (susceptibility) to novocain. Jurasz published two cases of unilateral paravertebral anesthesia in which 40 c.c. of a 1 per cent. novocain solution was deposited from the sixth thoracic to the first lumbar nerves. Anesthesia came on within five minutes after the injections were finished. The first patient was a woman, aged thirty-nine years, with severe myocardial decompensation; the second was a woman, aged seventy years, in very poor condition. In both, cholecystotomy for common duct stone was successfully performed.

*Technique.* The patient lies upon the left side with the knees drawn up to the abdomen. A strip 3 cm. away from the vertebral spine is anesthetized by subcutaneous injection of small amounts of 0.5 per cent. novocain. Just mesial to this line at the height of the sixth thoracic spine, the lower border of the transverse process is sought with the point of a thin, long needle. Immediately beneath this, the needle is introduced 0.5 to 1 cm. deeper, slightly toward the median line. In this region a little careful experimentation will suddenly result in the patient's experiencing a pain which runs from behind forward; at this moment 5 c.c. of a 1 per cent. novocain solution are immediately injected without changing the location of the needle. The pain ceases after a minute. According to the example of Braun, the first needle is left *in situ* as a landmark, and, with a similar needle, a corresponding puncture is made at the level of the next spine below and the process just described is repeated. As soon as the next nerve is struck by the point of the needle, as evidenced by the characteristic pain, the next injection is made. The second needle is now left in place while the first is removed, and in turn is introduced below. At the lowermost thoracic vertebræ the apices of the spines no longer serve as accurate guides for the points for puncture, because in this region the spines are nearer at right angles to the vertebral column. Under such circumstances one judges with his eye the distance between the upper puncture holes, and is guided accordingly. Considerable patience is required by both the surgeon and the patient, because at times it is difficult to locate the

<sup>1</sup> Deutsch. med. Woch., 1914, No. 24.

<sup>2</sup> Zent. f. Chir., 1914, p. 1409.



nerve, and at other times the patient is caused considerable pain. Jurasz lays special stress upon reaching the region of the intervertebral foramen, because, according to the investigations of Finsterer, the spinal ganglion, together with the ramus communicans of the sympathetic nerve, lie in this neighborhood, and their anesthetization is of the greatest importance in order to obtain a unilateral anesthesia of the peritoneum and intra-abdominal organs. Failures to obtain complete anesthesia are generally due to disregard of the rule not to inject until the characteristic nerve pain is produced by the point of the needle. Jurasz believes that the bilateral paravertebral anesthesia, as recommended by Kappis, is absolutely unnecessary for operations on the bile passages. Jurasz does not recommend paravertebral anesthesia as a routine measure, but reserves it for use in especially weak cases.

Schmiedt<sup>1</sup> justly remarks that the method of Kappis, by which the abdomen is rendered insensitive following bilateral paravertebral injection of eleven nerves (this means twenty-two searches and twenty-two injections), is entirely too taxing to the patient, and takes too much of the surgeon's time. Schmiedt has shown that a most satisfactory anesthesia can be obtained for operations upon the stomach by combining local anesthesia, according to the method of Braun, with bilateral paravertebral anesthesia of only the sixth, seventh, and eighth intercostal nerves. Under this the stomach could be delivered out upon the abdominal wall and all necessary measures could be carried on without causing the slightest pain. Only upon search for the duodeno-jejunal junction was there discomfort. Of the six stomach cases operated on according to this method, in two, extensive resections were made; toward the end of these the anesthesia began to wear away, requiring the administration of a little general narcosis. In a later case, bilateral paravertebral blocking of the eighth, ninth, and tenth intercostals resulted in satisfactory anesthesia of the stomach, but removal of the compresses inserted toward the liver and diaphragm, as well as traction upon the first loop of the jejunum, caused pain.

Siegel,<sup>2</sup> of Freiburg, reports combining paravertebral (under which term he includes parasacral) anesthesia with scopolamin-nacophin, *i. e.*, "twilight sleep," in 170 gynecological and obstetrical procedures. In 119 of these (70 per cent.) the anesthesia was complete, in the rest very slight doses of inhalation anesthetics were necessary.

Traugott,<sup>3</sup> of Frankfort, published a similar series in which scopolamin-pantopon narcosis was combined with parasacral anesthesia. In 50, of the 118 operations, there was complete anesthesia, with ideal relaxation of the abdominal walls. In 38, general anesthesia (ether or chloroform)

<sup>1</sup> Zentralbl. f. Chir., 1914, p. 1494.

<sup>2</sup> Deut. med. Woch., 1914, No. 28.

Münch. med. Woch., 1914, No. 27.

was required during the course of the operation for periods varying from twenty to ninety minutes. In only 8 cases was there complete failure; these were in inflammatory tumors of the adnexa.

**Braun's Method of Anesthetizing the Abdominal Wall** by means of infiltration of the tissues in a zone at some distance from the actual operative field was referred to above in reviewing the report of Schmiedt. The text-book of Braun<sup>1</sup> on this subject has been translated into English. In addition to minute general directions regarding the technique to be observed, the different methods of regional infiltration are clearly shown in the excellent diagram which elucidate the text. Considerable space is devoted to regional anesthesia of the different parts of the abdomen. One of the many advantages of Braun's method is that the tissues of the operative field are not distorted by the injected fluid as one sees when purely local infiltration is employed. Every surgeon should make himself familiar with this method of local anesthesia; it is of untold value in emergency abdominal surgery (as well as in other fields of emergency surgery).

The researches of Hoffmann and Kochmann, which demonstrated that potassium sulphate greatly accentuates the anesthetic effect of novocain, has made it possible to use even greater dilutions of the latter. (It was found that a 0.1 per cent. novocain solution combined with potassium sulphate equalled a 0.5 per cent. simple novocain-adrenalin solution.) The standard solution used by Braun<sup>2</sup> consists in:

Potassium sulphate	1
Sodium chloride . . . . .	7
Distilled water	q. s. ad 1000

To this stock solution novocain and adrenalin may be added in sufficient quantities to make the desired strength just before using.

From practical personal experience, the writer can recommend the use of this solution. It has given most satisfactory results provided the exact technique, as outlined by the authorities in this field, is faithfully carried out.

**Abdominal Incisions.** PERTHES' INCISIONS for exposure of the upper abdomen were fully described in *PROGRESSIVE MEDICINE* for June, 1913, pp. 70-75. At the 1914 meeting of the Deutsche Gesellschaft f. Chirurgie, Perthes reported a series of 57 cases in which this incision was used with satisfactory results. Hernias only occurred in those cases in which there was infection of the abdominal wound with necrosis of tissue (2 cases among 39 observed longer than half a year after operation).

**TRANSVERSE ABDOMINAL INCISIONS.** Wertheim<sup>3</sup> reported 400 drained, as well as undrained, cases. Wherever possible, transverse division of

<sup>1</sup> Braun's Local Anesthesia, translated by Shields, 1914.

<sup>2</sup> Zentralbl. f. Chir., 1913, p. 1513.

<sup>3</sup> German Surgical Congress, 1914.



the fascia, both in front and behind the rectus, was used, avoiding a cutting of the muscle as much as possible. The muscle was not cut unless this became absolutely necessary. As a rule it was freed from its anterior and posterior sheaths and drawn aside.

Bakes reported a series of 96 patients with transverse Sprengel abdominal incisions operated upon in 1910 and 1911. The series comprised 57 drained laparotomies with 3 dehiscences and 2 ventral hernias, 37 primarily healed wounds with one dehiscence. In other words, out of 96 cases, 90 gave an ideal result. Such separations as occurred always took place in the linea alba and were not difficult of repair.

Sick<sup>1</sup> is another adherent of this school; he advocates using abdominal incisions, the direction of which corresponds to the direction of the internal oblique and its aponeurotic fibers. If nerves are encountered they

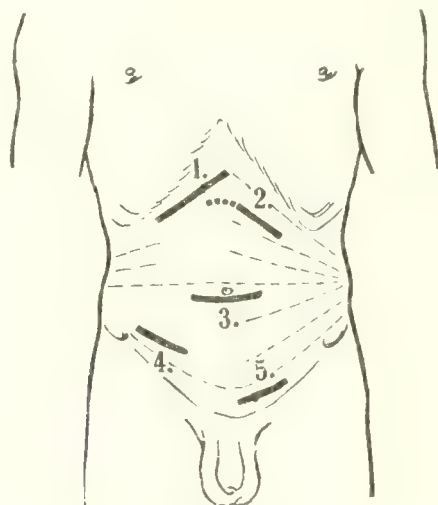


FIG. 16.—Abdominal incisions according to Sick, which follow the course of the internal oblique fibers. 1, Exposure of the bile passages; 2, exposure of the stomach (extension to the right if exposure of the bile tracts is required); 3, umbilical hernia; 4, appendix; 5, hernia.

are held aside with blunt retractors. In the epigastrium, an oblique incision (Fig. 16) divides the skin and anterior sheath of the rectus as well as part of the muscle, always taking care to leave some strands of the rectus intact. These should be the lateral strands if the incision is in the middle and the medial if the incision is made more to the side. If the anterior and posterior sheaths of the rectus are divided far enough, even beyond the median line, it may be possible to pull the rectus aside and obtain sufficient room without injuring the muscle itself. In other words, this is applying the principle of the Weir enlargement of McBurney's intermuscular incision to the epigastric region.

Following the recommendation of Sick, Drüner<sup>2</sup> strongly advocates this type of incision. Fig. 17 shows a patient with a healed arched epi-

<sup>1</sup> Zent. f. Chir., 1914, p. 585.

<sup>2</sup> Ibid., p. 845.

gastric incision through which a Billroth II resection of the stomach was made with drainage.

With his usual excellent judgment, Küttner<sup>1</sup> opposes the suggestions just outlined. He sees no reason for abandoning the customary longitudinal incisions. Küttner is satisfied with his results, and ascribes this success to observance of the following technical details: He uses silk sutures and ligatures in clean cases, reserving the use of catgut for infective cases. The suture lines, when completed, are lightly sponged with a 1 per cent. bichloride of mercury solution. All layers are closed with interrupted sutures, never with a continuous suture.

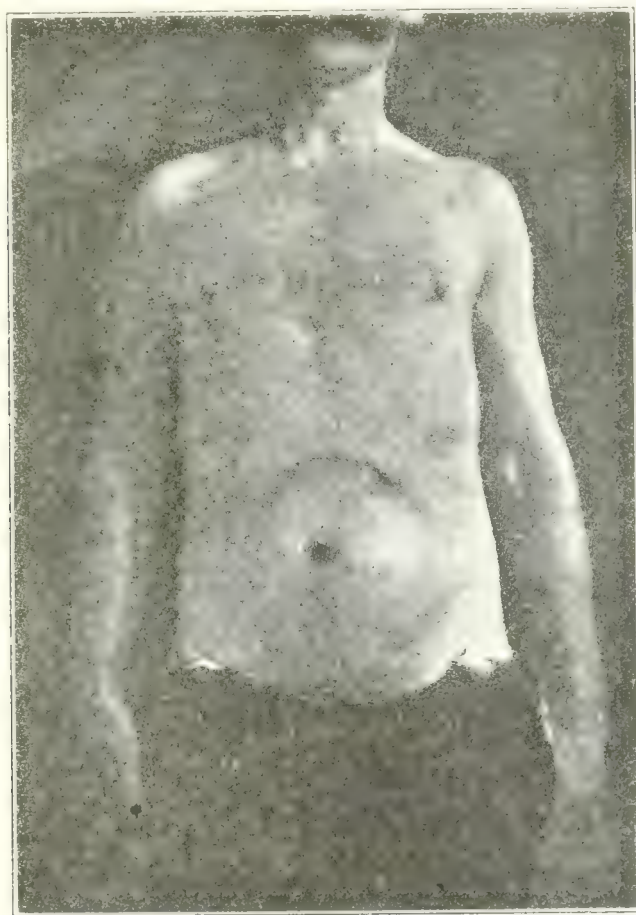


FIG. 17.—Arched epigastric incision; Billroth II resection of the stomach with drainage; operation September 12, 1913; publication May 16, 1914. (Drüner.)

Küttner concedes that transverse incisions frequently give a better exposure, especially in operations around the duodenum, or for hour-glass stomach when situated high up under the diaphragm. The transverse incision, moreover, is absolutely necessary where combined intra- and retroperitoneal operations are to be made. The disadvantage of the transverse incision is that its exact repair requires a great deal of time, and that this loss of time is disproportionate to the amount of time required by the actual intraperitoneal procedure.

<sup>1</sup> Verhandl. d. deutsche Gesellsch. f. Chir., 1914.



Furthermore, some of the patients with healed transverse incisions find it difficult to draw a deep breath. Lastly, the repair of a ventral hernia following suppuration of a transverse wound and separation of its margins, is a much more difficult problem than of that developing after a longitudinal incision. For all these reasons, at Küttner's clinic, the longitudinal incisions remain those of choice, and the transverse incisions the exception.

Space does not permit recounting all the points of interest brought out in his discussion, consequently only a few of his ideas will be given here.

In all abdominal incisions the greatest care is exercised to avoid injury of the nerves.

Whether the patient gets up early or late seems to have no influence upon the subsequent development of hernia.

Rupture of the abdominal wounds has not been observed by Küttner since he has employed interrupted silk sutures. He uses incisions of adequate size and condemns the use of button-hole openings.

The use of gauze as drainage material in the abdomen is steadily diminishing in his clinic.

#### **Surgical Emphysema following Operation in the Trendelenburg Position.**

The emphysema involved the skin of the entire abdomen and the right thigh along the vessels up to its middle. The condition subsided within a week. According to Lees<sup>1</sup> the mechanics of this are explained in that the abdominal wound was closed while the patient was still in the high Trendelenburg position. The air which was left behind after closing the abdomen was forced out through some gap in the peritoneum into the cellular tissue and worked its way along the sheath of the femoral vessels.

**Peritoneal Absorption.** Dandy and Rowntree,<sup>2</sup> using phenolsulphone-phthalein as an indicator, have confirmed the results obtained by Starling and Tubby and Mendel who concluded that absorption from the peritoneal cavity was into the blood and not into the lymphatics. Dandy and Rowntree state that the excretion of phenolsulphone-phthalein by the kidney is so rapid and uniform under normal conditions that it may be treated as a constant.

The result following intraperitoneal injection of phenolsulphone-phthalein may be summed up as follows:

- I. The appearance time in the *blood* is two to four minutes.
- II. The appearance time in the *urine* is four to six minutes.
- III. The appearance time in the *lymph* (thoracic duct) is twenty to sixty minutes.
- IV. The quantitative output of the *urine* for one hour is 40 per cent. to 60 per cent.
- V. The quantitative output in the *lymph* for one hour is less than 0.1 per cent.

<sup>1</sup> British Medical Journal, January 3, 1914.

<sup>2</sup> Annals of Surgery, April, 1914, p. 587.

It can therefore be seen that the lymph plays practically no part in the absorption of these fluids. This is true irrespective of the position in which the animal is retained following the injection.

The absorption from the normal peritoneal cavity in various postures was then studied. It was found:

I. That there is very active absorption from the peritoneal cavity in all postures (40 per cent. to 60 per cent. in one hour).

II. The absorption in the head-down (diaphragm) position is practically the same as in the ventral and dorsal positions. Consequently, on the basis of absorption, there is no evidence of an intraperitoneal current to the diaphragm.

III. The absorption in the pelvis-down (vertical) position is definitely (15 per cent.) less than in the other three positions. For this observed fact, Dandy and Rowntree have been able to find no adequate explanation. As just said, there is no evidence to support the view that there is an intraperitoneal current to the diaphragm and there is no evidence in favor of the claims that the central tendon of the diaphragm, or the diaphragm as a whole, performs more than its proportional amount of peritoneal absorption.

Dandy and Rowntree conclude that though Fowler's position, as originally instituted, was based upon entirely fallacious and disproved grounds, there is, according to their investigations, sufficient evidence to justify the employment of this postural method in the treatment of acute diffuse peritonitis.

**Abdominal Wounds in War Time** were last discussed in the pages of this section of *PROGRESSIVE MEDICINE* in 1908. At that time the prevalent impression was that, contrary to experience with gunshot wounds occurring in civil life, those received in war time had a relatively benign character. At the beginning of the present war similar views were expressed by Cumston,<sup>1</sup> writing from Switzerland, Payr,<sup>2</sup> and De Lorme.<sup>3</sup> Thus Cumston cites the well-known observations made during the South African (Boer) War and the Russo-Japanese War, namely, that the mortality of operated cases is greater than that of those in patients treated by temporizing and conservative measures. Cumston quotes Bornhaupt,<sup>4</sup> who had 182 cases in the Russo-Japanese War. The majority of these presented peritonitis at the time of operation. The operated cases had a mortality of 50 per cent., and of those treated conservatively, 22 per cent.

In the peritonitis cases coming to the surgeon late, operative intervention should be limited to simple drainage of localized abscesses (see also Payr).

<sup>1</sup> Boston Medical and Surgical Journal, October 15, 1914, p. 591.

<sup>2</sup> Münch. med. Woch., 1914, No. 33.

<sup>3</sup> Paris Letter, Journal of American Medical Association, September 4, 1914, lxiii, p. 1042.

<sup>4</sup> Langenbeck's Archiv., vol. lxxxiv.



The empty stomach is simply perforated by the modern bullet, the wound of exit being slightly larger than the wound of entrance, while a full stomach struck by a bullet is burst apart.

In searching for the wound of exit through an incision in the anterior gastric wall, Cumston emphasizes the necessity of making the wound large enough to afford a clear view. To show the disadvantages of a small opening, he cites the case of the late President McKinley in which digital examination through a small incision in the anterior wall of the stomach failed to find the perforation in the posterior wall. It must not be forgotten that the wound of exit may be in the posterior wall of the duodenum.

Payr advises establishment of suprapubic drainage within the first twenty-four to forty-eight hours. Later, abscesses in the pouch of Douglas are to be opened.

De Lorme states that the most recent wars, namely, those in the Transvaal, Manchuria and the Balkans have shown the harmfulness of laparotomy. According to this author, the German bullet makes a small orifice in entering the abdomen and carries with it no septic substance. The holes it makes in the intestines tend to close spontaneously.

Where larger wounds have been inflicted and infection is inevitable, the abdomen is opened and flushed with ether, according to the method of Morestin, after which simple drainage is instituted.

In contrast to the above is the report of Hoguet<sup>1</sup> who worked under Blake in Paris during the first few months of the war. He says (in part):

"That the modern rifle bullet is not a harmless one when it penetrates the abdomen now seems to be an indubitable fact. The typical penetrating wounds are not seen at the base hospitals, or, if they are, it is only in the stage in which a localized abscess has formed. From accounts of a number of men who have been doing active service at the front, few laparotomies are done there on account of inadequate facilities. The opinion of most of these men is, that there is little effort on the part of the mucous membrane to close up the perforation. Most patients with abdominal wounds are now being transported to the nearest base hospital in a sitting position, and are there treated expectantly. Luckily, localized abscess-formation is the rule. In no case of this kind is operation performed at the base hospital unless there is a definite abscess. One case was seen at the American Ambulance in which the bullet had entered the left iliac region and had made its exit through the middle of the sacrum. This patient had no abdominal symptoms for almost one month, when an abscess began to develop on the left side. A number of cases of fecal fistula were seen which had been sent to the base hospitals from those at the front after acute symptoms had subsided. The majority were low down in the iliac, or lumbar regions, but several

<sup>1</sup> Journal of American Medical Association, lxiii, p. 2198.

unusual ones were seen higher up in the abdomen, the highest being in the sixth intercostal space in the anterior axillary line."

Bullet wounds in the lower part of the abdomen anteriorly or through the buttocks posteriorly were found to be especially interesting and particularly fatal. The reason for this was the frequent perforation of the large intestine with resulting abscess. Apparently a retroperitoneal cellulitis was set up, predisposing to erosion of large bloodvessels, with consequent fatal hemorrhage.

Wounds of the perineum were comparatively rare, though in several cases shrapnel balls or shell fragments were found lodged there (Fig. 22). The greatest amount of destruction of tissue from shrapnel observed was seen in a case of this kind. Practically all of the perineum had been destroyed here and a large part of the tissues on the inner aspect of both thighs.

Still more interesting is the report of Rotter,<sup>1</sup> who encountered 59 gunshot wounds of the abdomen in four field hospitals along the Aisne, amount a total of 1218 wounded. *Examination of bodies of those dying on the spot from abdominal wounds showed that the mortality from such injuries was fully 90 per cent.* Among those living to reach the field hospital it was 80 per cent. In the clearing hospital it was 40 per cent. to 50 per cent., and in the home hospital it was 0 per cent. This shows that the discrepancy between the mortality of abdominal wounds in peace and war is not very great. Rotter states that a spontaneous cure of a bullet wound of the bowel is possible only when the perforation is small, without prolapse of mucosa or with prolapse only when adjacent tissue becomes adherent and thus prevents leakage. The greater the number of perforations, the less likelihood is there of this sort of closure by adhesions. Naturally, leakage is also governed by the question of whether the bowel is full or empty at the time of injury. In 11 cases (9 operations, 2 autopsies) there was only 1 case in which there were not several holes in the bowel and in this one the subject succumbed to a diffuse peritonitis. In none of the remainder could spontaneous recovery have occurred; hence, if cases are seen within the first twelve hours after injury, operative treatment is indicated. Later than this the results of surgical treatment are no better than those under conservative measures.

Collapse alone need not deter the surgeon from operating. The conditions for aseptic operation are so good in the German field hospitals that Rotter says no hesitation is felt on this account.

Makin, in his book on the South African War, came to conclusions similar to those expressed by Rotter.

In the light of these it is easy to see how the surgeons at the base hospitals acquired the erroneous impressions about the relatively benign

<sup>1</sup> Med. Klin., January 3, 1915.



character of gunshot wounds of the abdomen in war time. Their conclusions regarding the treatment of the late cases coming under their care, *viz.*, that conservative treatment gave a lower mortality than operative interference, are to a large extent correct.

Where, for one reason or another, operation either was not indicated or could not be done for lack of facilities, the conservative treatment (on both sides) was carried out as follows: Absolute rest was maintained, avoiding transportation, if possible, and, if not, reducing this to a minimum; complete abstinence from food and drink for from four to seven days. Water was administered by subcutaneous infusion. The patient was kept in Fowler's position and the pangs of hunger and thirst were deadened by the free exhibition of morphine.

**Danger in the Rectal Administration of Sugar Solutions.** Rimbaud's<sup>1</sup> patient was a child of five years, who had nearly recovered from a severe scarlet fever with angina and a double otitis media; an incidental severe hemorrhage nephritis had just come on. Some 350 c.c. of a 5 per cent. glucose solution were injected. An enormous distention came on; the pulse was 152. A huge amount of foam was passed during the following twenty-four hours. The patient ultimately recovered.

**Quinine Salts in Postoperative Treatment.** Bonnot<sup>2</sup> reports a series of twenty laparotomies in the after-treatment of which 10 grains of quinine muriate, given *per rectum* every six hours, seemed to have lessened the nausea, vomiting, gas pains, backache, and postoperative thirst. This preliminary report is interesting; the final report ought to be still more so.

**Pituitrin in Postoperative Distention** has received favorable mention in scattered reports<sup>3</sup> during the past year. However, the number of observations is too small to warrant the drawing of definite conclusions. It is to be noted that the various pituitary extracts upon the market differ widely in potency and toxicity.

**Permanent Gastric Siphonage** was mentioned in this section in 1911.<sup>4</sup> I had the opportunity of meeting Westermann, the originator of the method, at the meetings which took place in New York last spring; he told me of its continued success in acute postoperative dilatations of the stomach. Grosse<sup>5</sup> reported obtaining as much as 5 liters a day from the stomach in this way.

Westermann has applied the procedure to fifteen patients, Kappis to ten, and he himself to nine. In one case the tube was left in place for four days. Kappis and Westermann both advise keeping the outlet of the tube on a level with the bed to prevent aspiration of the gastric mucosa into the mouth of the tube and possible injury thereby.

<sup>1</sup> Zentralbl. f. Chir., 1914, p. 297.

<sup>2</sup> Journal of American Medical Association, lxiv, p. 146.

<sup>3</sup> Harvey, Medical Record, March 21, 1914 (30 cases); Stanley, Surgery, Gynecology, and Obstetrics, June, 1914, p. 766.

<sup>4</sup> PROGRESSIVE MEDICINE, June, 1911, p. 103.

<sup>5</sup> Archiv. f. klin. Chir., Band ciii, Heft 4.

In the discussion which followed, Körte warned against using this method in cases of ileus from mechanical causes. Pauchet<sup>1</sup> has also used this with success.

**Antiseptic Solutions in Peritonitis.** Favorable reports crop up every year only to die down again. For example, last year<sup>2</sup> the ether lavage of Morestin was favorably reported; this year the procedure is condemned by Arnaud,<sup>3</sup> and by Pluyette and Bernard,<sup>4</sup> they were able to collect 7 cases, including one of their own, in which the peritonitis was not checked in the slightest.

In the same category belongs the use of 2.5 per cent. iodine in alcohol, in quantities from 2 or 3 ounces, as high as 32 ounces, depending upon the extent of the infection.<sup>5</sup>

**Prevention of Adhesions** by injection of various substances also has its crop of annual communications; thus Pribram<sup>6</sup> showed some excellent results in cats using quantities of vitreous humor of the calf; while Schmidt,<sup>7</sup> using hirudin to prevent adhesions, was completely successful in 4 out of 7 experiments. Powdered magnesium and tincture of iodine were used to produce the adhesions.

**Leukocytosis in Intraperitoneal Hemorrhages.** An increased leukocytosis is usually looked upon as a differential diagnostic point between appendicitis and salpingitis in contradistinction to ectopic gestation. Hoessli<sup>8</sup> reports two cases of ruptured ectopic pregnancy and two cases of hemorrhage from the ovary in which the abdomen was filled with blood. In all there was a marked leukocytosis which quickly subsided after operation.

**Control of Oozing.** Jeger,<sup>9</sup> who has specialized in vascular surgery, reported good results from the use of finely divided dried animal membrane.

The method of controlling oozing from parenchymatous organs by the application of smoothly fitting sheets of fascial tissue is made still more effective by Waljaschko and Lebedew<sup>10</sup> who aspirate all blood and clot from beneath the fascial sheet after its application by means of a water jet vacuum pump.

The coagulin of Fonio<sup>11</sup> continues in well-deserved favor.

**Mesenteric Thrombosis.** Weil<sup>12</sup> differentiates between the ascending and descending thrombosis of the mesenteric vein. In the ascending

<sup>1</sup> Archiv. Prov. de Chir., 1914, No. 5

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1914, p. 81.      <sup>3</sup> Lyon Med., 1914, p. 1369.

<sup>4</sup> Arch. Provencale de Chir., 1914, p. 305.

<sup>5</sup> Crisler and Johnson, Southern Medical Journal, February, 1914.

<sup>6</sup> Verhandl. Deut. Ges. f. Chir., 1914.

<sup>7</sup> Langenbeck's Archiv., Band civ, Heft 4.

<sup>8</sup> Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xxvii, Heft 4.

<sup>9</sup> Verhandl. deut. Ges. f. Chir., 1914.

<sup>10</sup> Archiv. f. klin. Chir., Band ciii, p. 255.

<sup>11</sup> Mitt. a. d. Grenzgeb. d. Med. u. Chir., xxvii, Heft 4; Zent. f. Chir., 1914, p. 1569.

<sup>12</sup> Münch. med. Woch., 1914, No. 20.



type the main trunk of the portal vein is not involved, the process taking its origin in the radicles of one region. On the other hand, in the descending type, the portal trunk becomes thrombosed first and the symptoms of portal stasis dominate the clinical picture. The prognosis in cases of the ascending type is much better than in the descending type, no case of operative recovery being known when the portal vein was the primary seat of thrombosis. Weil states that if the spleen is large, there is not much chance of recovery unless the portal vein is opened and the thrombosis extracted, a procedure which may be technically impossible in certain cases.

**Free Gas in the Peritoneal Cavity.** In a man, aged fifty-three years, a gangrenous appendix was removed from an abscess situated toward the median line, and a pelvic abscess was also opened and drained. At first convalescence was smooth, but on the fifteenth day, repeated chills accompanied by high fever were followed by loss of strength and difficulty in movement of the bowels with progressive distention, so that on the twenty-second day after the operation the abdomen was distended like a barrel. Falkenberg<sup>1</sup> determined to establish an enterostomy but, as soon as the abdomen was opened, a large amount of odorless gas escaped from all parts of the abdomen. There was no peritonitis except around the area drained. After operation, the abdomen remained collapsed and recovery followed. Falkenberg, also refers to the case reported by Rüder in which a similar distention occurred on the thirteenth day after Cesarean section and here too, the abdomen was reopened for the sake of establishing an enterostomy and a large amount of odorless gas escaped and recovery likewise followed.

**Retroperitoneal Tumors.** 1. RETROPERITONEAL GANGLION NEUROMA. The case of a boy, aged four years, is published by Rapp,<sup>2</sup> of Czerny's clinic in Heidelberg. For three years previously a soft, steadily enlarging tumor had been noted. It lay to the right of the spinal column extending from the free border of the ribs down to the crest of the ileum. There was increasing paralysis of both extremities and of the bladder and rectum. At operation, the tumor was found so intimately attached to the spinal column that two transverse processes and some of the dura had to be removed. The pia and spinal cord were free. Complete extirpation of the tumor was not possible. After operation there was partial recovery from the paralyzes. The microscopical examination showed ganglion cells and nerve strands in large numbers; also muscle fiber, connective tissue, and a sort of glia. Rapp believes the starting point came from the sympathetic. In his review of the literature he was able to collect 33 cases of ganglioneuroma. Of these, 24 were chance findings at autopsy. The 9 retroperitoneal cases came to operation. Of these, 5 recovered.

<sup>1</sup> Deutsch. Zeitschr. f. Chir., Band cxxxiv, p. 130.

<sup>2</sup> Bruns, Beitr. z. klin. Chir., 1913, Band iii, p. 576.

2. RETROPERITONEAL FIBROMA weighing 34½ pounds. A man, aged forty-eight years, presented himself to Childe<sup>1</sup> stating that his abdomen had grown progressively larger during the last five years. He was a very thin man but his circumference at the waist was 124 cm. The abdomen was completely filled with a large tumor having many areas of calcification. After a long and difficult operation in which the extensions of the tumor toward the pelvis and up under the diaphragm were completely isolated, Childe removed the tumor in its entirety. It originated from perinephric fat of the left side. Microscopical examination showed it to be a myxofibroma.

The removal of a retroperitoneal fibroma may be of great technical difficulty. I once knew an operator to remove a retroperitoneal fibroma the size of a small watermelon which showed a white mark upon the posterior surface of the tumor some three inches long. This proved to be the wall of the inferior vena cava. The patient died an hour or so after operation.

3. RETROPERITONEAL LIPOMA. A woman, aged forty-three years, complained of progressive enlargement of the abdomen in the right iliac region for the past five years. The tumor gradually invaded the left side until it reached to the hypochondrium. At operation a huge retroperitoneal lipoma was found by Mauclore,<sup>2</sup> which filled the entire pelvis and reached up under the liver and diaphragm. There was also infiltration of the mesentery. Because of its intimate relationship with the mesenteric vessels, it was not possible to effect complete removal.

4. RETROPERITONEAL DERMIDS. Kaposi reports removal of a 14-pound retroperitoneal dermoid in a girl, aged fourteen years. The patient recovered. In the discussion which followed, Philipowicz reported a *presacral dermoid* in a man, aged thirty-four years, from the Clinic of Küttner. At a combined abdominal-sacral operation, the tumor was removed, with resection of the coccyx. A part of it could not be extirpated from the anterior surface of the sacrum. It separated the leaves of the mesosigmoid. Weight, 10 kg. Microscopical examination showed ganglioneuroma.

5. A CAVERNOUS HEMANGIOMA OF THE MESENTERY in a fifteen-year-old boy is reported by Juillard.<sup>3</sup>

An irregular immovable tumor reached from the stomach to the symphysis. A diagnosis of either fibroma or lipoma of the mesentery was made. At operation, a tumor of the mesentery, the color of a normal kidney, 25 to 30 mm. in circumference, was found between the leaves of the mesentery. It became necessary to resect the intestine in order to effect extirpation of the tumor. Recovery. The tumor

<sup>1</sup> British Medical Journal, October 25, 1913 (Zent. f. Chir., 621).

<sup>2</sup> Bull. et Mém. de la Soc. de Chir. de Paris, 1913, p. 1746.

<sup>3</sup> Ibid., 1914, p. 442.



weighed four kilos. Two other cases, one of which was also Juillard's, were cited.

**The Permanent Drainage of Ascites** has had its usual quota of new operations. The simplest, as well as the most reasonable, procedure is that of Cumaris,<sup>1</sup> who, following the principle of the Talma and similar operations, removes extensive areas of the anterior parietal peritoneum thereby producing abundant adhesions. He publishes one case.

Oberst<sup>2</sup> provides for escape of ascitic fluid from the peritoneal cavity to the subcutaneous tissue of the abdominal wall by means of a partially freed flap of skin, either formed into a tube or left as a partially folded strip. He believes that the edges of the laparotomy opening will not

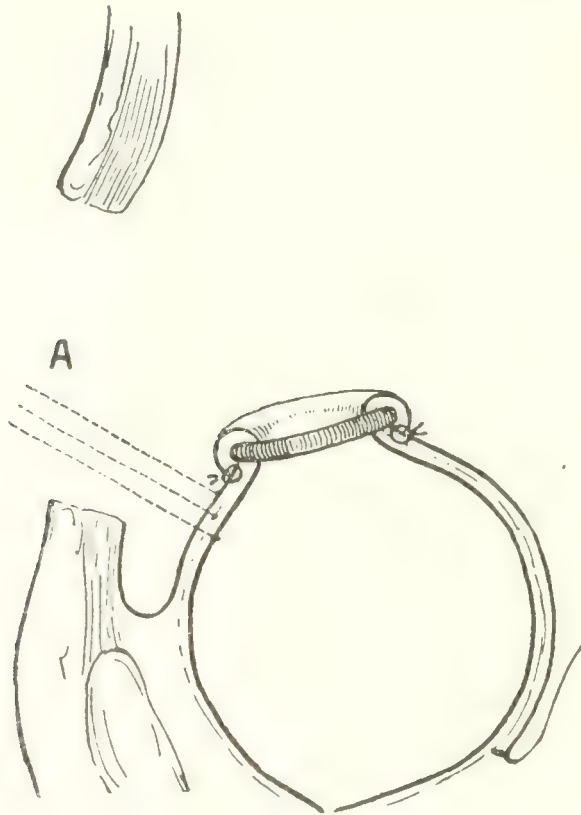


FIG. 18.—First step in Rosenstein's operation for valve formation in the urinary bladder wall. Through a silver ring placed upon the summit of the bladder, some of the bladder wall has been drawn. The bladder has then been opened, everted, and sewed over the ring. (Rosenstein.)

adhere to the epidermal surface of the flap. Probably the entire flap will become encysted, for it is very unlikely that this will not suffer the fate of many other attempts at direct drainage.

The details of Rosenstein's valve formation of the wall of the urinary bladder are given rather because of the ingenuity displayed than because of any belief that it will be repeated.

Rosenstein<sup>3</sup> reported that the patient in whom he made an Eck fistula

<sup>1</sup> *Zentralbl. f. Chir.*, 1914, p. 1609.

<sup>2</sup> *Ibid.*, p. 1465.

<sup>3</sup> *Ibid.*, p. 373.

for ascites in 1911, was not permanently benefited by the operation.<sup>1</sup> After transperitoneal exposure of the bladder he placed a silver ring about double the size of an ordinary wedding ring upon the summit of the bladder. Through this ring the bladder wall was pulled, the bladder was then opened and turned over the ring to all sides where it was sewn, serous to serous surface, with interrupted stitches of silk (Fig. 18). Peripheral to this ring, a circular strip 4 cm. broad was removed consisting of the serous and muscular coats down to the mucous coat (Fig. 19). After excision of this seromuscular ring, the adjacent sides of the wound were again united (Fig. 19) by suture. The denuded mucosa now formed

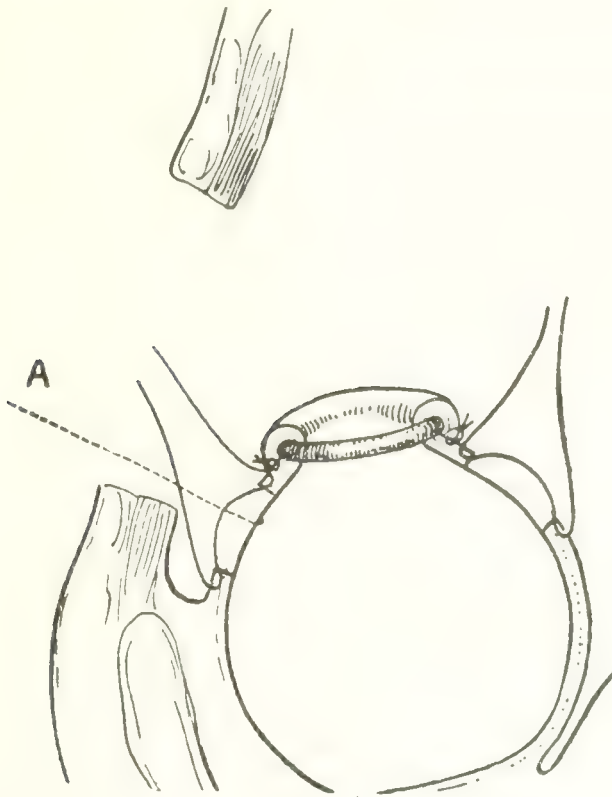


FIG. 19.—A circular seromuscular strip has been excised just outside of the buried ring, the mucous coat being left. (The sutures passed through the margins of the defect and about to be tied are shown.) (Rosenstein.)

a circular flap projecting into the bladder (Fig. 20) making a valve which prevented egress of urine into the abdominal cavity. Convalescence was uneventful. Rosenstein stated that ascitic fluid flowed into the bladder and was emptied together with the urine. By cystoscopic examination he was able to observe that the valve functionated properly and prevented any escape of urine into the peritoneal cavity. Rosenstein conceded that the result of the operation was not quite perfect because the patient had to be tapped for ascitic accumulation eight weeks after operation, however the amount of ascites was much less. Formerly the same amount was obtained within eight days after

<sup>1</sup> See PROGRESSIVE MEDICINE, June, 1913, p. 177.



puncture. The urine contained albumin, white blood cells and granules of fat in the sediment.

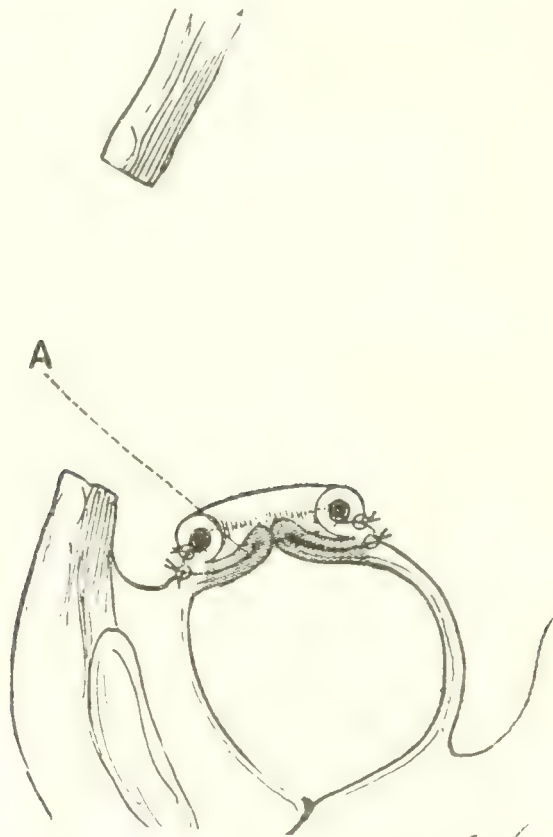


FIG. 20.—Upon tying the sutures the mucosa is pushed inward toward the centre of the ring, forming a valve permitting ingress of ascitic fluid and preventing egress of urine. (Rosenstein.)

The annual modification of *Bartlett's anastomosis clamp*<sup>1</sup> appeared in the June number of *Surgery, Gynecology, and Obstetrics*, 1914, p. 761. This year (Fig. 21) it has broad flanges 5 inches long by  $1\frac{3}{4}$  inches

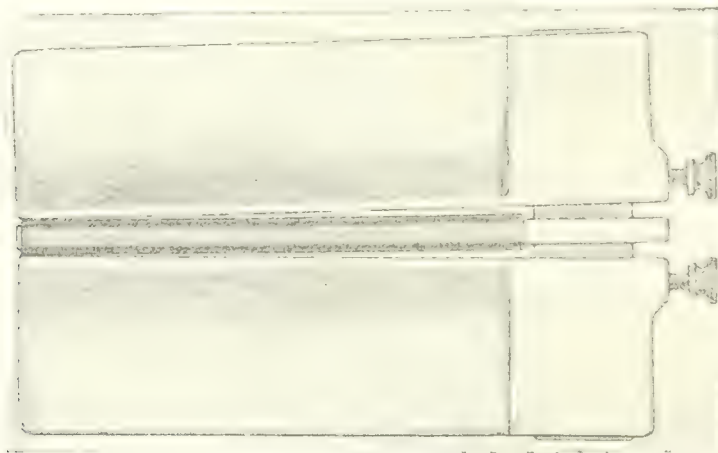


FIG. 21.—Bartlett's anastomosis clamp.

<sup>1</sup> See also *PROGRESSIVE MEDICINE*, June, 1914, p. 61; June, 1913, p. 95; June, 1914, p. 85.

broad. The entire apparatus is made of aluminum. The best modification of this principle, however, is that of C. L. Gibson, of New York. He employs three of the ordinary wooden tongue depressors (spatulæ) between which the two loops of intestine are held by means of elastic bands applied to both projecting ends of the tongue depressors. The simplicity and the ease for improvisation of this apparatus must appeal to everyone.

### STOMACH AND DUODENUM.

During the past year noteworthy communications have been presented at three important congresses, namely, the International Surgical in New York, the German Surgical in Berlin (April, 1914), and the Clinical Congress of Surgeons in London (July, 1914). Rather than divide the subject into subheadings beneath which the various opinions in this field are collected, each report is briefly recounted, believing that in this way the reader will acquire a clearer impression of the authorities' personal views and of the reasons influencing them.

**Diagnosis of Gastric and Duodenal Ulcers.** The excellent report by De Quervain,<sup>1</sup> of Basle, delivered before the International Surgical Congress in the spring of 1914, contains a large collection of interesting and well-observed facts.

As regards the LOCALIZED SPASM OF THE GASTRIC WALL at the level occupied by an ulcer, De Quervain points out that in the empty stomach the spasm is absent, whereas if material is introduced, even if it be only air by inflation, the spasm will appear. The exhibition of atropin or papaverin frequently causes the spasm to disappear.

If repeated Röntgen examinations reveal that the spasm is constant in its situation, it may be concluded with certainty that an ulcer exists. If, at operation, no spasm is seen in the relaxed stomach, it may be induced by inflation through a stomach tube.

Spasm is known to occur in other conditions besides ulcer, and ulcers occur which are not associated with spasm. It is not known in what percentage of ulcers circumscribed spasms occur.

The SIX-HOUR RESIDUE, according to De Quervain, is of diagnostic value only when the test meal is a pure carbohydrate contrast meal and contains no albumin (milk) or fat, and when, during the first six hours, neither a further meal nor more fluid is introduced into the stomach. A six-hour residue may be caused by purely functional disturbances, as follows:

1. In purely functional diminished motility, especially in connection with ptosis, the stomach shows a diminished peristalsis.
2. In pylorospasm excited by an ulcer remote from the pylorus.



Sometimes in penetrating ulcers at the lessser curvature there is considerable retardation in the removal of food from that section of the stomach immediately beyond the ulcer. This delay is explained by some radiologists as due to a reflex pylorospasm, an explanation which is corroborated by De Quervain's own observation but is denied by Faulhaber.<sup>1</sup> (See also review of Smithies' article below.)

3. In the so-called duodenal motility, in the initially accelerated and subsequently abnormally retarded emptying of the stomach, we find a diminished two-hour residue and an abnormal six-hour residue, whereas in pure pylorospasm the stomach also holds an abnormally large content after two hours.

The distinction is easily made by investigation after two hours.

4. In toxic pylorospasm (morphine, nicotine, etc.) as a part of the phenomenon of the gastrosplasm recently described by Holzknecht and Lueger.

5. In hyperacidity without ulcer.

In discussing ORGANIC STENOSIS, De Quervain points out that the contrast material (whether in normal time or somewhat delayed) can be entirely expelled, even when larger food particles are retained through mechanical impediment. This is true of the common gastric ulcer, but especially so of carcinoma in which case the contrast meal often enters the intestine at the normal rate of time, while coarser food particles, for instance residues of prunes, are retained twelve hours or longer. In one instance of carcinomatous stenosis, De Quervain observed that more than twelve half figs remained in the stomach for two weeks while the entire contrast meal entered the intestine though the time was somewhat retarded. In cases of ptosis, larger food particles are said to remain in the bottom of the flabby gastric sac, according to Sahli. In short, *emptying of the stomach within six hours by no means excludes organic stenosis*. The presence of an accumulation of waves of great depth should awake a suspicion of organic stenosis.

The WATER TEST FOR GASTRIC MOTILITY, first described by von Mering, is favorably mentioned. Its efficiency depends upon the fact that water will pass through the pylorus even when all solid food is retained. Holzknecht and Fujiami, following Schwarz and Kaestle, have investigated, with the aid of submerged and buoyant bismuth pills, the time consumed in expelling 200 c.c. of water from the stomach. Under normal conditions the stomach became empty anywhere from fifty-five to eighty minutes, averaging about sixty minutes, while in cases of organic stenosis the period became lengthened to from one hundred and five to one hundred and fifteen minutes. De Quervain says that if these findings are further confirmed they will prove extremely useful for differentiating between organic and functional stenoses.

<sup>1</sup> Berliner. klin. Woch., 1914, No. 29.

DUODENAL MOTILITY is by no means present in all cases of duodenal ulcer and, on the contrary, it is observed in other affections of this region; thus it may occur in hyperacidity without ulcer, and again in early stages of carcinoma of the body of the stomach, and, finally, in diseases of the pancreas and the gall-bladder.

“Diagnosis of a gastric ulcer is usually a positive one, that of the duodenal ulcer is a diagnosis *per exclusionem*.” (De Quervain.)

It may be mentioned in passing that, theoretically, the filling out of the duodenum with contrast substance must also arise in cases of arterio-mesenteric intestinal exclusion, particularly when there is a decided bend of the duodenum as it becomes jejunum. But the fact that in reality such a stasis is rarely observed, shows, as Moynihan correctly remarks, that “Lane and Jordan go a great deal too far in their diagnosis and that their conception is not justified by the Röntgen picture.”

In *x-ray* work, as was formerly the case in clinical observation, adhesions are diagnosed too often.

The cases of duodenal carcinoma, which De Quervain observed within the last year, could not be positively diagnosed by means of the Röntgen rays.

When obstinate vomiting follows establishment of a gastro-enterostomy (vicious circle), the Röntgen examination is of the greatest value in deciding whether, in the first place, a second operation should be performed, and, secondly, if so, what should be done at the time. In reply to the first question, the Röntgen examination usually gives the correct answer. Thus if nothing has passed out of the stomach after six hours, the need of interference is very great, especially if the closure continues longer than twelve hours in spite of change in the patient's position (the right-sided and the knee-elbow positions). On the contrary, if the intestine becomes partially filled, in spite of a large gastric residue, one is justified in waiting, for the impediment will probably be removed of itself. If the stomach, as well as the upper duodenal peduncle, are filled, De Quervain considers that a true vicious circle is present which can only be remedied by a Braun's entero-anastomosis. But when both afferent and efferent loops are empty, the gastro-enterostomy stoma is of no value, and it must be so cared for that the newly created opening between the stomach and intestine functionates. De Quervain insists that surgeons, at a secondary operation, often cannot accurately size up the situation at a glance and correctly determine the source of trouble. He believes that the Röntgen picture affords much more reliable data as to the character and locality of the obstruction.

After excision of ulcers and after transverse resections, circumscribed spasms in the region of the suture lines often last for a long time. These spasms may be dispelled by atropine. They do not impair the gastric function.



**The Differentiation of Pyloric Spasm of Extra-gastric Origin** from that associated with uncomplicated gastric ulcer on or near the lesser curvature.

Smithies<sup>1</sup> believes that in young individuals of both sexes the most common cause of gastric hyperacidity is pyloric spasm associated with subacute or chronic inflammation of the appendix or gall-bladder. Frequently the hyperacidity is accompanied by hypersecretion. On account of the clinical aspect of this group of cases, the diagnosis is frequently made of "medical" gastric ulcer. However, a small fraction of this group (one out of nine) actually suffer from gastric ulcer associated with pyloric spasm. In other words, there is no differentiating feature in 11.1 per cent. of the cases. In these, if at the first *x*-ray examination, abnormal peristaltic waves are found indenting the greater curvature, especially when the stomach is kneaded or tapped, and if tender areas along the lesser curvature are found which move with change of position of the stomach, or tenderness is present in the mid-epigastrium or in the right iliac fossa or in the region of the gall-bladder, the patient then receives  $\frac{1}{50}$  grain of atropine sulphate by hypodermic and is rescreened in half an hour. If much of the bismuth or barium mixture has left the stomach, more should be given. At the second examination, palpation is vigorously carried on along the lesser curvature. This will usually locate a point of maximum tenderness. "Palpation at this point will generally be accompanied by such permanent spasm of the circular muscle fibers of the stomach wall as to bring out a readily recognizable incisura on the greater curvature. This is approximately at the same level as the local tender area on the lesser curvature. The phenomenon may be elicited with the stomach moved laterally or vertically. The incisura thus brought out after atropine is readily distinguished from normal peristalsis. Tenderness over the pyloric region is a variable finding . . . ." In cases of pyloric spasm associated with appendix or gall-bladder lesions but with no gastric ulcer present, vigorous palpation along the lesser curvature may be accompanied by evidence of tenderness but fails to delimit local foci of distress associated with niches along the greater curvature, or areas of local tenderness that correlate with the stomach on its being moved about.

Reëxamination of the patient on different days should demonstrate the constancy of the differential sign outlined above.

Smithies' experience covers a personal study of 7041 consecutive test-meal analyses at the Mayo Clinic and at the Augustana Hospital, in 2183 of which operation was made and the diagnosis thereby controlled. In addition to this, there were 1600 Röntgen-ray examinations made for the sake of observing gastric function.

<sup>1</sup> Journal American Medical Association, lxii, p. 1308.

**Simple Ulcer of the Stomach Demonstrated by X-rays.** Petréu and Edling<sup>1</sup> report that an ulcer with 2.5 cm. diameter and soft thin walls gave an x-ray picture showing a "Nischen symptom" from the thinned-out wall of the bed of the ulcer yielding to intragastric pressure. They claim this to be the first instance where this "Nischen symptom" was found in an ulcer which was not a callus one.

**Surgery of the Stomach and Duodenum.** The report by Hartmann and Lecene at the International Surgical Congress, apparently represents the consensus of French opinion.<sup>2</sup> It is a little disappointing in its scepticism.

They state that the pyloric vein is an untrustworthy landmark.

They believe that the symptoms given as characteristic of the existence of duodenal ulcer by German and American authors (pain, periodicity, food relief, etc.) are simply signs of a pyloric spasm whatever its cause may be. They also state "practically, these discussions lose much of their interest since, whether the ulcer is seated on the gastric or on the duodenal side of the pylorus, the conduct of the surgeon will vary but little."

While conceding that the data furnished by simple gross examination of a lesion are not entirely free from criticism and have only a relative value, nevertheless, these authors insist that they permit us to differentiate at once an ulcer from a cancer of the stomach.

They attach no value to frozen sections, saying that this technique is really a snare, for in the doubtful and difficult cases (the only ones important of this class) rapid examination of a few sections hastily seen can give no certainty. And they repeat "reliance must then be placed upon the macroscopical examination and upon the previous clinical study of the living patient . . . ."

The development of a cancer upon a chronic ulcer of the stomach is rarer than certain authors consider it to be.

At the time of establishing the gastro-intestinal opening, fragments of the gastric mucous membrane were removed for the sake of histological study. Among 30 fragments of mucosa they found inflammatory changes in 25, from which they conclude that, in ulcer, the entire gastric mucosa is frequently altered. Consequently, the importance of post-operative medical treatment continued over a long time cannot be underestimated if one wishes to obtain permanent success.

By true duodenal ulcer is meant "a lesion sufficiently distant from the pylorus to insure that the pylorus is neither involved in the ulceration nor invaded by a peri-ulcerous inflammatory process which may give rise to the phenomena of spasmodic symptoms of reflex origin." It is no wonder, therefore, that they find such a true duodenal ulcer rare, with a frequency of 1 to 10 in comparison with gastric ulcers.

<sup>1</sup> Fortschr. u. d. Geb. d. Roentgenstr., Band xxi, Heft 1.

<sup>2</sup> Annals of Surgery, August, 1914, p. 227.



As to the *x*-ray examination for duodenal ulcer, the method of Holzknecht is referred to, in which bismuth is injected directly into the duodenum by a duodenal tube after which the duodenojejunal angle is compressed. Hartmann and Lecene say, "This delicate manœuvre complicates very much the examination with a screen and increases proportionately the chances of error." (The observations of Lippmann, George and Gerber, and Cole flatly contradict this.) In perforated gastric ulcer lavage is only indicated for mechanical removal of food masses.

Duodenal fistula is treated by gastro-enterostomy with the exclusion of the pylorus, an operation already performed by Berg, Moynihan, and Knaggs.

In hemorrhage, transfusion has proved of the greatest value. They practice ligation of the vessels in the neighborhood of the ulcer. They have no personal experience with jejunostomy established for the sake of securing absolute rest of the stomach. Likewise they have had no experience with pyloroplasty and raise the theoretical objection that it is performed in a region too near the site of disease.

They frequently perform pylorotomy for callous ulcer. They have never practiced the unilateral pyloric exclusion of von Eiselsberg.

In performing gastro-enterostomy, great importance is attached to establishing the stoma at the most dependent point of the pyloric antrum quite near the greater curvature. The suture method is invariably employed, the button never. Clamps are not used for fear of producing trauma which may lead to secondary development of gastro-jejunal ulcers.

Hartmann<sup>1</sup> cites experimental and clinical evidence that under certain circumstances material will pass through the gastro-enterostomy opening in the presence of a patent pylorus. Experiments on 7 dogs showed that evacuation of the stomach occurs principally through the anastomosis if situated at the lowermost part of the pyloric antrum, and through the pylorus if the anastomosis is situated at the fundus of the stomach.

The radiological examination of patients who before operation presented neither stasis nor stenosis, confirmed the results in dogs. Hartmann always placed his anastomosis at the lowermost part of the pyloric antrum and observed that the evacuation of the gastric contents took place partly through the anastomosis and partly through the pylorus. It was found that to a certain extent *x*-ray plates were misleading, or in cases in which the bismuth had passed through the pylorus, a loop might be seen leaving the greater curvature, thus giving the illusion of passage of material through a gastro-intestinal anastomosis, whereas the actual condition was a superimposing of the initial portion of the duodenum by the stomach, the jejunal shadow only separating from

the stomach below the greater curvature. Fluoroscopic examination was found to be indispensable for accurate diagnosis. One could then see the bismuth pouring into the stomach and passing through the anastomatic opening before reaching the pylorus. In this way it was impossible to mistake evacuation through the anastomosis for an evacuation through the pylorus. Nineteen patients were examined from one to eleven years after operation. In one case everything passed through the pylorus; in eleven, everything passed through the anastomosis and, in seven, material passed both through the anastomosis and the pylorus. From this Hartmann and Lecene conclude that the lowermost part of the pyloric antrum is the only proper site for establishing the stoma. In uncomplicated duodenal ulcers they perform gastro-enterostomy with or without blocking the duodenum by infolding of the ulcer. As said before, they are still undecided regarding excision of duodenal ulcer.

They find that failures of gastro-enterostomy are especially frequent in cases of penetrating callous ulcers of the lesser curvature or posterior wall.

Obliterations of the gastro-enterostomy openings are believed to come from ulceration of the margins of the stoma followed by cicatricial stenosis. "They have been observed in cases of pyloric stenosis as well as in those of permeable pylorus. There is no longer any possible dispute upon this question."

GASTRIC AND DUODENAL ULCER was the subject of von Eiselsberg's<sup>1</sup> paper read at the Clinical Congress of Surgeons in London (July, 1914). During the past ten years, 334 gastro-enterostomies for ulcer were performed at his clinic in Vienna. Of these, 17 died shortly after operation; in 12, the ulcer was recent; 8 died from causes referable to the ulcer itself (hemorrhage or progressive ulceration). *In some cases gastro-enterostomy not only did not stop hemorrhage but apparently induced it.*

The results of gastro-enterostomy for extrapyloric ulcers were not as satisfactory as for those near the pylorus. Postoperative peptic ulcer of the jejunum occurred seven times. Of 41 patients who died, most of them years after the gastro-enterostomy, 13, that is, nearly one-third the number, died of carcinoma, while 6 succumbed to the continued extension of the ulcer.

UNILATERAL PYLORIC EXCLUSION was performed in 36 cases. Of these, 12 were done too recently to judge of the permanency of their cure. Of the remaining 24, 11 were cured, 1 lost sight of, 5 improved, 4 unrelieved. In the last group, resection of the entire ulcer relieved one, another suffered repeated attacks of hemorrhage, two developed postoperative peptic ulcer, but no further operation was performed. Three died at a later date, 1 of carcinoma, 2 of postoperative peptic ulcer.

Gosset<sup>2</sup> observed two cases operated upon by von Eiselsberg himself

<sup>1</sup> Surgery, Gynecology, and Obstetrics, November, 1914, p. 555.

<sup>2</sup> Bull. et Mém. de la Soc. de Chir. de Paris, 1914, p. 331.



in which hemorrhages recurred. This was confirmed by Tuffier in the discussion which followed.

Twice von Eiselsberg observed the *shrinking of the gastro-enterostomy* opening to one-third its size without any appreciative induration. This he believed is brought about by the healing of a not very intensive peptic ulcer; it may even lead to closure of the fistula. Of the cases in which *peptic ulcer* developed, one was particularly interesting, that of a girl, aged twenty-seven years, who had a posterior gastro-enterostomy performed for chronic stenosis due to ulceration. Soon after, she developed a peptic jejunal ulcer which was confirmed by operation. Because of the extension of the inflammatory process, a jejunostomy was done. For three years the patient was given all her food through the fistula. The tumor disappeared entirely so that she could be fed from above, thus allowing the fistula to close. The simple removal of the catheter was sufficient and the patient has been entirely cured for two years past. In another interesting case gastro-enterostomy and jejunostomy were done at the same time. Previously this patient had a high general acidity combined with an unhealed ulcer which extended into the duodenum; unilateral pyloric exclusion was done. After a short time the pains recommenced, the patient was relaparotomized, and a peptic ulcer at the site of the gastro-enterostomy found. Consequently a new anterior gastro-enterostomy plus entero-anastomosis was established, as well as a jejunostomy. The patient died with symptoms of hematemesis. At postmortem, 5 recent ulcers were found distal to the jejunal stump. One of the ulcers was on the point of perforating. At the site of the old gastro-enterostomy opening was an annular ulcer which appeared to be turning into a gastro-colic fistula.

In short, of the 17 cases of peptic ulcer, 5 occurred in patients on whom gastro-enterostomy had been done by other surgeons and in one on whom von Eiselsberg himself had operated. There were 4 patients who developed peptic ulcer following unilateral pyloric exclusion. Only one patient of the 15 operated upon for peptic jejunal ulcer was cured, 4 improved, 3 lost sight of, 2 unrelieved, and 5 died. The chief symptom in all of these was the development of a painful induration in the neighborhood of the gastro-enterostomy fistula, the discomfort and pain becoming so great that one could scarcely touch the spot.

Von Eiselsberg says "I have observed this formidable complication in a surprisingly large number of cases and I cannot tell why I have met with peptic ulcers more frequently than other surgeons. I should not like to say how much technique has to do with it. Peptic ulcers appear to me to be more frequent during the last year, and I am inclined to attribute their frequency to the fact that open or unhealed ulcers are operated on more frequently than formerly." Von Eiselsberg insists that, whenever possible, the peptic ulcer should be excised. He has found that neither gastro-enterostomy nor jejunostomy are sufficient

in themselves and in many cases both operations combined are of no avail. In one case, hemorrhage from the ulcer persisted in spite of jejunostomy. Likewise gastro-enterostomy is not, in all cases, a complete protection against continuance of hemorrhage.

Transverse resection of the stomach for ulcer when the latter has invaded neighboring organs, is considered the only means of curing the condition.

This was performed eighteen times without a single death.

The entire article is worth close study. Space does not permit of a longer review, the reader is therefore referred to the original text in case the subject is of sufficient interest.

Sherren,<sup>1</sup> in discussing von Eiselsberg's paper, reported a series of 424 cases of gastro-duodenal ulcer, of these 200 were gastric and 224 duodenal. Like the Mayos, he emphasizes that the whole abdomen should be thoroughly examined and in most cases the appendix removed, except when the patient is seriously ill from hemorrhage or perforation. In his earlier cases he neglected to do this, and since has had to operate a number of times for gall-stones and chronic appendicitis neglected at the original operation. He infolds chronic duodenal ulcer of the anterior wall and performs gastro-jejunostomy, with most satisfactory results. The operative mortality was 2 per cent. in a hundred cases operated upon more than two years; 3 have since died from other causes; 85 have remained in perfect health. In his entire series he has had 5 jejunal ulcers and has reoperated upon them without mortality. He considers gastro-jejunostomy the operation of choice in cases of chronic duodenal ulcer. He does not agree with the majority of surgeons who believe that gastro-jejunostomy is an unsatisfactory procedure when the ulcer is situated elsewhere than near the pylorus. He states, "Simple chronic gastric ulcers, wherever situated, will heal as a result of gastro-jejunostomy correctly performed *unless they are adherent and have perforated*, the floor being formed by *pancreas or liver*, thus preventing the contraction necessary to sound healing. He is convinced that gastro-jejunostomy alone so modifies gastric conditions that ulcers heal, and that, as just said, only when complications have arisen is excision or partial gastrectomy necessary." He remarks, "I have had the opportunity of proving this in 6 of my cases in whom chronic ulcer situated on the lesser curvature had been treated by gastro-jejunostomy alone. In 3 cases I had to operate again for causes unconnected with the ulcer or original operation, and in 3 was able to examine the stomach after death from other causes more than two years after operation. In all, the ulcer had perfectly healed. After excision alone, recurrence of ulceration is common. "It should never be done except as a complement to gastro-jejunostomy.

<sup>1</sup> Surgery, Gynecology, and Obstetrics, November, 1914.



In performing gastro-jejunostomy, he states, "That unless debarred by the situation of the ulcer, the anastomosis should be made to the pyloric segment of the stomach. Small ulcers are invaginated. If there is a suspicion of malignancy, or if adherent to the pancreas or liver, excision is carried out. Apparently he also performs the Polya operation, for he says, "During the last two years I have, after closing the duodenum, brought the jejunum at its origin through an opening in the transverse mesocolon and united it directly to the divided cardiac end of the stomach. This makes the operation simpler and shorter; convalescence is as uneventful as when the stomach is closed and the separate anastomosis is carried out."

In no instance has Sherren found it necessary to practice any method of pyloric exclusion.

Of carcinoma developing upon the bed of an ulcer, he says, "While I am a firm upholder of the opinion that in a certain percentage of cases, carcinoma of the stomach follows directly on chronic gastric ulcer, I believe that promiscuous excision would lead to a greater mortality than that which would follow the carcinomas that might develop if they were treated by gastro-jejunostomy alone."

"Hemorrhage in chronic ulcer calls for operation as soon as possible after the first attack, usually within the first twenty-four hours. The ulcer should be directly treated by ligature of the vessels on each side of it, by inversion, or excision, followed by gastro-jejunostomy."

"There is no difference whatever in the results in those cases operated upon for ulcer at a distance from the pylorus and those at the pylorus, or in those in which the ulcer was excised in addition to gastro-jejunostomy . . . ."

"In conclusion, I would say that gastro-jejunostomy still remains the operation of choice in chronic duodenal ulcer and in the large proportion of cases of chronic gastric ulcer. It is only where complications have arisen that excision has to be added to the operative treatment."

Paterson,<sup>1</sup> of London, goes much further than Sherren and champions simple gastro-enterostomy as a panacea for ulcer and its complications. His explanations regarding the physiological effects by partial neutralization of the stomach juices from admixture with the bile and pancreatic secretions seem entirely sound, but his views in regard to hemorrhage and malignant degeneration of callous ulcer are not in accord with general experience.

Speaking of the technique he says, "It will, I think, be agreed that a gastro-jejunostomy opening should be placed as close as possible to the normal outlet of the stomach—in other words, near to the pylorus. In the posterior short-loop operation this is an anatomical impossibility. On the other hand, the long loop of the anterior operation is undoubtedly

a disadvantage. In short, the posterior operation is good anatomically but physiologically unsound. The anterior operation is good physiologically but anatomically bad." Paterson sutures the mesocolon to the stomach a little bit away from the suture line. The recurrence of symptoms in some instances are due to mechanical defects at the site of anastomosis, such as constriction produced by contraction of the mesocolon encircling the anastomosis. In other cases there is a kink produced by contraction of the dilated stomach, or by formation of adhesions, or by rotation of the jejunum on its longitudinal axis during the progress of suturing. Another cause of trouble is the narrowing of the lumen of the attached jejunum owing to the insertion of the serous suture too far from the cut edge. In Paterson's own experience, the results of the posterior operation are good, but those of the anterior operation are slightly better.

"The view that the gastro-jejunostomy acts by preventing the food from passing over the ulcer (duodenal) is no longer tenable. We know from the evidence of radiography that in some cases the food continues to leave the stomach by the pylorus. If the mechanical explanation of the action of gastro-jejunostomy be correct, such cases would not be benefited by the operation. This is contrary to experience. If the mechanical explanation of gastro-jejunostomy be correct, the pylorus should be occluded deliberately in every case when performing gastro-jejunostomy. Some surgeons do this, but, so far as I am aware, there is no evidence to warrant the conclusion that the results in cases in which the pylorus has been occluded are better than those in which this has not been done. According to Paterson, it is immaterial whether the food leaves the stomach by the pylorus or by the stoma. He believes that gastro-jejunostomy does not invariably hasten the evacuation of the stomach. Hence it does not prevent the contact of food with the ulcers of the lesser curvature. "There are some who deny that a gastro-jejunostomy is of any value in cases in which the ulcer is not near the pylorus. I hold a strong opinion to the contrary." (Paterson has performed a considerable number of gastro-jejunostomies for ulcer of the body of the stomach and followed up the after-results with great care, and in one case only has the result been not satisfactory.) He believes the most striking effect of gastro-jejunostomy is the marked diminution of total acidity. "From examination of a large number of cases, I find that the average diminution of total acidity after gastro-jejunostomy is 30 per cent. This is due partly to diminution of the total chlorides secreted by the gastric mucosa and partly to neutralization of free hydrochloric acid by bile and pancreatic juice gaining entrance to the stomach through the anastomotic opening. The presence of bile can be detected in 73 per cent. of patients after gastro-jejunostomy." He believes that the presence of bile in the gastric contents is a constant and very important feature after gastro-jejun-



ostomy. His reason for this is that in 99 per cent. of his cases there was, after gastro-jejunostomy, an increase of the mineral chlorides in the gastric juice. This increase was not due to greater activity of the gastric mucosa because, as a rule, there was a diminution of the total chlorides as just mentioned. "If, then, this increase in the mineral chlorides be not the result of greater gastric activity, it must be due to chloride added from without to the gastric contents, namely, to the mineral chlorides of the bile and pancreatic juice. Conversely, on several occasions Paterson had the opportunity of performing gastric analyses on patients before and after gastro-jejunostomy and again after gastro-jejunostomy had been undone. The result was always the same—an increase in the mineral chlorides after gastro-jejunostomy and a decrease toward the normal after restoration of the alimentary canal to its original condition. In cases with gastro-jejunostomy and entero-anastomosis, thus allowing the bile and pancreatic juice to be diverted through the entero-anastomotic opening, there was a decrease in the mineral chlorides in the stomach. An excess of bile in the gastric contents after anterior gastro-jejunostomy was accompanied by a high percentage of mineral chlorides, and as this excess gradually disappeared, there was a corresponding decrease in the mineral chlorides. The increase in mineral chlorides does not follow operations other than gastro-jejunostomy. The relief afforded by gastro-jejunostomy, according to Paterson, comes from the lowering of the total acidity due to admixture of bile and pancreatic juice. According to Paterson, therefore, in ulcers of the body of the stomach, and as a treatment for hemorrhage, gastro-jejunostomy is indicated. As regards hemorrhage, he believes that in the majority of cases gastro-jejunostomy is an efficient treatment because the hemorrhage comes not from the ulcer but from erosions of the gastric mucosa either secondary to hypersecretion or to hyperacidity. Gastro-jejunostomy removes both of these conditions and so allows the erosions to heal. He sums up his standpoint in the four following conclusions:

1. That the type of gastro-jejunostomy employed is of less importance than the manner in which it is performed.

2. That occlusion of the pylorus is an unnecessary complication of gastro-jejunostomy and is based on erroneous pathology.

3. That if gastro-jejunostomy be a physiological operation, its use for the treatment of gastric hemorrhage is correct and explicable.

4. That if gastro-jejunostomy be a physiological operation, then it is as efficient a treatment for ulcers of the body of the stomach as for ulcers near the pylorus. In other words, gastro-jejunostomy is preferable to excision.

Paterson regards the view as to the great frequency with which carcinoma is grafted on simple ulcer as not proven. He believes that malignant degeneration of ulcers occurs in less than 3 per cent. of all cases after the operation of gastro-jejunostomy for supposed simple

ulcer. "Viewed from this standpoint, the teaching that excision of simple ulcers is advisable or necessary is not based on established conclusions and is contrary to clinical experience."

Both Küttner<sup>1</sup> and Heyrovsky<sup>2</sup> advocate simple gastro-enterostomy for ulcer as a result of their experience in large series of cases. Thus, according to Küttner, gastro-enterostomy gave complete cure in 65 per cent. and distinct improvement in 20 per cent. for ulcer. No perforation occurred. Gastro-enterostomy for sagging of the stomach causing a kinking of the pylorus, gave surprisingly good results. Pyloric exclusion gave no better results than simple gastro-enterostomy alone.

In a series of 301 cases of ulcer of the stomach, Heyrovsky reports 74 operations for callous ulcer of the lesser curvature. He agrees with Hochenegg in the belief that gastro-enterostomy is the best method for treating the majority of ulcers. Extra-pyloric ulcer is almost as successfully treated by gastro-enterostomy as ulcer at the pylorus. Resection does not give better results and is indicated only when there is reason to believe that a carcinoma is present and when gastro-enterostomy has not effected a cure.

Rodman,<sup>3</sup> of Philadelphia, one of the foremost advocates of excision of the ulcer-bearing area in the treatment of gastric ulcer, took nearly the opposite position to Paterson. He said that excision of the ulcer prevented subsequent hemorrhage, perforation, subphrenic abscess, hour-glass stomach and malignant degeneration, while neither pyloroplasty nor gastro-enterostomy prevented any of them.

The operation of Finney, introduced in 1902, has grown in favor and seems particularly applicable in the treatment of duodenal ulcer.

Rodman communicated with one hundred American surgeons regarding gastro-enterostomy for ulcer and was particularly impressed by three points: First, that the mortality on gastro-enterostomy had not been less than 5 per cent. Second, that the end results were frequently disappointing to the surgeon and disastrous to the patient. Third, that a number of perfectly satisfactory gastro-jejunostomies, from an operative point of view, were followed a year or more later by malignant disease and death. Or, as one of the members of the American Surgical Association expressed it, "two-thirds of the patients who survive the operation are cured, one-sixth are better, while the remaining one-sixth are rank failures, no better, and perhaps worse, than before operation."

Speaking of this subject, W. J. Mayo says "In 3 cases out of 4 when we remove a suspicious ulcer, it proves to be a carcinoma and a number of cases after gastro-enterostomy for supposed ulcer have developed carcinoma so quickly as to make it almost certain that it existed at the time of operation."

<sup>1</sup> Archiv. f. klin. Chir., cv, No. 4, p. 769.

<sup>2</sup> Verhandl. d. Deutscher Naturforscher u. Aerzte, 1914, No. 2, p. 391.

<sup>3</sup> Surgery, Gynecology, and Obstetrics, January, 1915, p. 25.



Surgeons cannot make an accurate macroscopical diagnosis in chronic gastric lesions. Moynihan, in 1908, stated that in 72 per cent. of operations for gastric cancer there had been a well-marked history of ulcer varying from three to twenty-six years.

Rodman says that it was reasonably certain that extra pyloric ulcers are not only much less frequent, comprising but 20 per cent. of the total number, but also rarely undergo malignant change. Eighty per cent. of all ulcers are found in the pyloric fifth. The greater traumatic irritation to which ulcers of the pylorus or the pyloric antrum are subjected, seems to furnish adequate reason why they are so prone to malignant change. Likewise in this region they are most likely to be followed by perforation and hemorrhage, and, when the latter occurs, on account of the large vessels in this situation, it is apt to be severe. Therefore a more radical treatment of such ulcers is called for, and *pylorectomy* which removes largely the ulcer bearing area, *is the operation of choice*, provided that the pyloric end of the stomach can be easily mobilized and the patient is in good condition. The radical operations of excision and pylorectomy are only slightly more dangerous while far more beneficent than gastro-enterostomy.

Where mechanical conditions (adhesions) make the pylorectomy difficult, simple gastro-enterostomy should be established, the anastomosis being made about the middle of the stomach.

Ulcers away from the pyloric end should preferably be treated by partial gastrectomy or removal of the ulcerated area (excision). This operation has a very slight mortality (1.7 per cent.).

THE TREATMENT OF GASTRIC HEMORRHAGE is still in a most unsatisfactory state. Thanks, however, to the newly devised methods of *sodium citrate transfusion*, the average practitioner can now avail himself of the method and can apply it as successfully as the greatest expert, provided, of course, he observes the proper precautions in selection of donors. (See also remarks about transfusion in cholemic hemorrhage under "Liver.")

The localization of simple ulcers which are bleeding and which are so recent that no visible changes are present in the serosa, is a most difficult problem. Von Haberer<sup>1</sup> recommends careful *examination of the lymph nodes along the curvatures* because the presence of a single enlarged or reddened lymph node often indicates the location of the ulcer. Careful palpation in the neighborhood of such a node has frequently enabled him to locate ulcers of less than 1 cm. in diameter near the curvatures.

The majority of hemorrhages, even the alarming ones, stop of themselves. It is claimed by the advocates of gastro-enterostomy that this operation has stopped the bleeding; while we all know that the majority

<sup>1</sup> Verhandl. d. deutsch. Ges. f. Chir., 1914.

of cases have stopped bleeding after operation, there is a most reasonable suspicion that this was a coincidence. There are enough instances in the reports just gone over and in the previous articles in this section during the past few years to convince one that in a definite small percentage of cases, fatal hemorrhage has taken place in spite of gastro-enterostomy, with or without pyloric exclusion or jejunostomy. These measures all aim to put the stomach at rest and thus favor clotting at the bleeding point. Much more rational are those procedures which directly control bleeding either by ligation of the vessels around the ulcer or by infolding of its wall or excision. Alberts<sup>1</sup> reports 5 cases in which Braun made *multiple ligature of the arteries along the gastric curvatures*. Besides this, either jejunostomy or gastro-enterostomy was established to afford the stomach rest. One patient died of profound asthenia, the others recovered.

GASTROSTOMY AS A SUBSTITUTE FOR JEJUNOSTOMY has probably been used by every surgeon of large experience at some time or other. Last year it was described under the title of Neumann's Omental Cuff method for closing perforated ulcers with indurated margins.<sup>2</sup> This year Moynihan<sup>3</sup> used it at operation for gastro-jejunal ulcer eight months after posterior gastro-enterostomy by another surgeon. These were adhesions of the middle portion of the transverse colon to the under surface of the left lobe of the liver and diaphragm. After separating these, the stomach was found normal in outline with the scar of an old ulcer on the anterior surface of the first portion of the duodenum. The gastro-enterostomy anastomosis was of adequate size and in the correct position. On feeling the stoma with the finger, a hard nodule the size of a shilling with a dimple in its centre could be detected. This was thought to be a gastro-jejunal ulcer. Through a transgastric incision, this was exposed; the assistant passed two fingers, one on either side of the jejunal loop so as to grip the ulcer, and thus everted the posterior wall through the incision in the anterior wall, bringing the gastro-jejunal ulcer into view. The ulcer was almost entirely gastric just at the edge of the stoma. A piece of silk was found hanging loose from the region of the ulcer. Excision was performed with scissors, and the opening in the posterior wall closed with through-and-through sutures passed from the mucosa. The anterior incision was then closed, leaving only room for No. 14 catheter which was passed into the stomach and along the efferent jejunal loop. The patient made an uneventful recovery and the gastrostomy tube was removed on the twenty-first day; feeding by mouth then commenced. Ten days later the patient left the hospital in excellent health.

Watson Cheyne<sup>4</sup> suggests that, in both gastric and duodenal ulcers,

<sup>1</sup> Deutsch. f. Chir., Band cxxx, p. 398.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1914, p. 129.

<sup>3</sup> Lancet, March 14, 1914.

<sup>4</sup> Ibid. August 1, 1914, p. 184.



gastrostomy with passage of the tube well down the duodenum, combined with infolding of the ulcer where this is possible, might act better than jejunostomy and might possibly take the place of gastro-enterostomy and occlusion of the pylorus in those cases of duodenal ulcer in which the infolding of the ulcer did not produce serious constriction of the lumen of the duodenum. Cheyne reports a case in which there was an ulcer of considerable size on the posterior surface of the stomach high up near the cardiac end firmly adherent to the parieties behind. There was a contact ulcer of the anterior wall opposite to the posterior lesion. Because of the unfavorable conditions for adequate excision, Cheyne performed a gastrostomy beyond the ulcer by Witzel's method, pushing the catheter through the pylorus and down the duodenum for about three inches. The tube was left *in situ* for six weeks and the wound was allowed to heal up. The immediate relief was most remarkable. The time since operation is not stated.

GASTROSTOMY CASES EXAMINED BY THE X-RAY. According to Max Cohn<sup>1</sup> the picture is that of an hour-glass stomach. The stomach fills from the bottom up (contrary to the usual filling from above downward as normally seen). The tube usually lies in the pyloric portion or even down into the duodenum. The stomach was found to empty itself rapidly. There was practically no evidence of gastric digestion.

THE EFFECT OF ANEMIA AND DIET UPON THE HEALING OF EXPERIMENTAL ULCERS. Bolton<sup>2</sup> reports that when animals, the subjects of acute gastric ulcers, are placed on a milk diet the stomach empties rapidly and the growth of epithelium over the base of the ulcer and the filling up of the latter with granulation tissue, occurs with precisely the same regularity and rate at all stages of the healing process regardless of whether the animal is anemic or normal. The growth of granulation tissue and the regeneration of the epithelium are not in the least interfered with by the anemia. On the other hand, when either the anemic or control animals with ulcer are allowed meat, invariably there is a delay in the healing. This should have a direct bearing on the dietary regulations to be observed in the after-treatment of ulcer cases, especially bleeding ulcers.

ULCER OF THE LESSER CURVATURE. From the foregoing we see that there are those who believe that simple gastro-enterostomy suffices in many instances to cure ulcer of the lesser curvature, others believe gastro-enterostomy is useful only when such ulcers are not adherent to adjacent organs; if this complication ensues, excision is necessary.

(a) *Transverse resection* of the stomach for ulcer of the lesser curvature is very favorably reported upon by continental surgeons. As mentioned above, von Eiselsberg performed this operation eighteen

<sup>1</sup> Deutsch. Ges. f. Chir., 1914.

<sup>2</sup> Journal of American Medical Association, lxiii, p. 1700.

times without a death. Perthes<sup>1</sup> reported 17 cases, among these a woman aged eighty-six years, and a man, aged seventy-one years; all recovered. The end-results were most gratifying. Spasmodic tendency to hunger seizures of considerable intensity ("Heisshunger") was one of the notable remaining symptoms after operation.

Von Haberer and Redwitz<sup>2</sup> examined the gastric secretions after 29 resections of Enderlen's. (Control examinations were made before operation.) They found that total acidity and free acid were always reduced after resection. Examinations were made at various intervals from sixteen days to two years after operation. The time elapsed made no difference in the chemical findings.

*Late Results in Penetrating Callous Ulcer of the Body of the Stomach Examined by the X-rays.* Haudeck's<sup>3</sup> observations are most instructive. They consist in a series of 250 cases during the past four years. Of 66 gastro-enterostomies, 8 died, 26 recurred, and the indications were that many of the supposedly cured cases would also recur in due course of time. X-ray examination showed persistence of the niche in spite of excellent function of the gastro-enterostomy opening. In contrast to all other postoperative results, 14 out of 17 *transverse resections* of the stomach were cured. The typical x-ray picture after transverse resection shows a short contracted stomach with extremely quick emptying of contents through the open pylorus.

(b) *The Treatment of Gastric Ulcer by the Actual Cautery.* Balfour points out that excision of gastric ulcer may be a formidable operation even in the hands of experienced surgeons and cites a case in which a slight but persistent late hemorrhage resulted fatally in spite of secondary gastro-enterostomy and transfusion of blood. At autopsy, it was found that the mucous membrane had separated and left a large denuded area from which the bleeding took place. Apparently, after the excision of the ulcer, the mucosa showed such a tendency to retract, that in a few days the stitches either cut through or gave way. This observation prompted the author to devise some method whereby the ulcer could be destroyed in such a manner as to obviate any possibility of hemorrhage without removing an appreciable amount of healthy gastric wall. Balfour hit upon the idea of using the actual cautery for this purpose. He states that while it has been used at the Mayo Clinic in a sufficient number of cases to warrant reporting, they are not yet in a position to state how the size, character and situation of the ulcer will affect the limitations of the method. Their technique for treating an ulcer of the lesser curvature is as follows: The portion of the gastrohepatic omentum in the region of the ulcer is carefully dissected free from the lesser curvature (Fig. 22). The ulcer is carefully palpated

<sup>1</sup> Deut. Zeitschr. f. Chir., Band cxxix, p. 461.

<sup>2</sup> Med. Klin., 1914, No. 16, p. 680.

<sup>3</sup> Verhandl. d. deutsch. Ges. f. Chir., 1914.



and the point of a Paquelin cautery, maintained at a dull red heat, is slowly carried through the ulcer until artificial perforation is produced. Burning with a moderate degree of heat is continued until the actual area of the ulcer is entirely destroyed (Fig. 23*a*). The resultant perforation is shown in Fig. 23*b*. The opening is then closed by interrupted sutures of chromic catgut reinforced by mattress sutures of silk (Fig. 24*a*). The reflected gastrohepatic omentum is then replaced over the



FIG. 22.—Ulcer on anterior wall with gastrohepatic omentum dissected from lesser curvature. (Balfour.)

site of the ulcer and fixed by superficial interrupted sutures of fine silk (Fig. 24*b*).

The electric cautery will prove even more convenient for this than the Paquelin.

(*c*) *Transgastric Operations*.—Thomas,<sup>1</sup> after opening the stomach, scraped radially from the centre of the ulcer with a sharp spoon

<sup>1</sup> British Medical Journal, June 6, 1914.



FIG. 23.—(a) Burning out ulcer. (b) Ulcer burned completely through. (Balfour.)

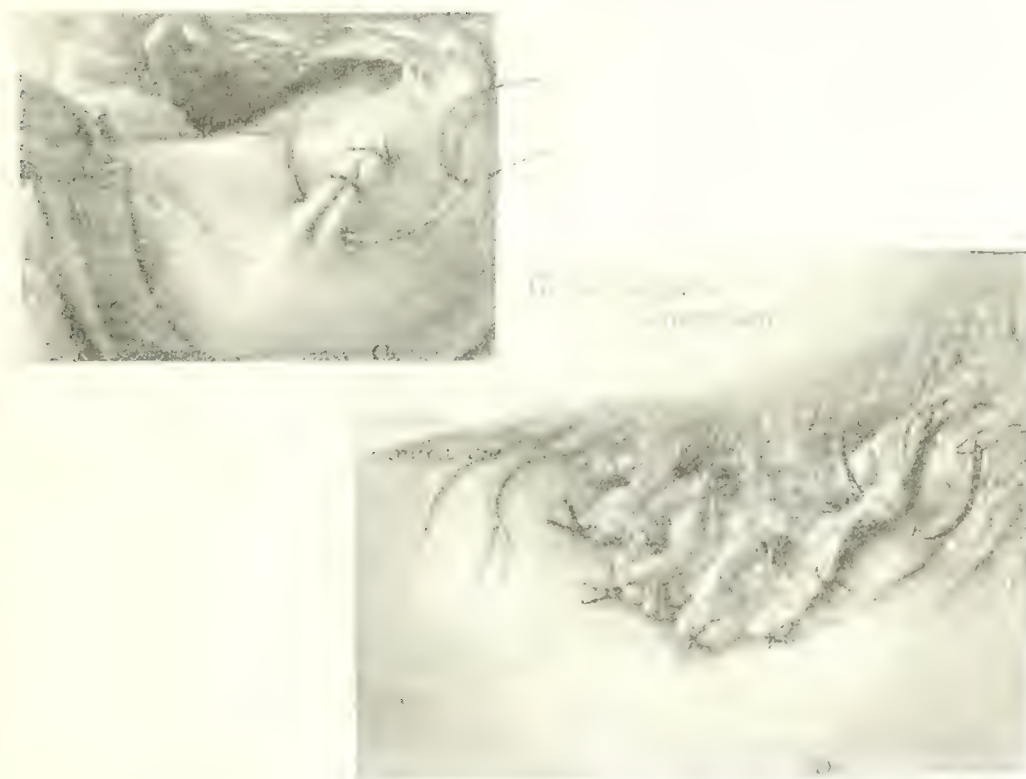


FIG. 24.—(a) First row of sutures closing opening from which ulcer has been excised. (b) Ulcer area covered by gastrohepatic omentum. (Balfour.)



so that all the unhealthy tissues, as far as the under surface of the mucous membrane, are removed. The exposed fresh base of the ulcer is then cauterized with the actual cautery to stop hemorrhage. The mucous membrane is mobilized all around the edge by means of a long, blunt-pointed scissors curved on the flat. All macroscopically unhealthy mucous membrane is removed from the edge by means of a bone rongeur. The healthy mucous membrane is now sutured and the gastrotomy wound, through which the operation is done, is closed once more.

Kraske<sup>1</sup> reports 12 cases in which he exposed the callous ulcer of the lesser curvature through an opening in the anterior wall, curetted away the inflammatory tissue and sewed the edges together. In one case dying from another cause, it was found that the ulcer had completely healed and that the scar was scarcely visible.

(d) *Plication Combined with Gastro-enterostomy.* Wagner<sup>2</sup> operated on a woman, aged fifty-four years, for ulcer causing chronic hemorrhages. He found an hour-glass contraction opposite a callous ulcer of the posterior wall high up which had a crater admitting one finger. On account of its high situation, a transverse resection would have been very difficult. After mobilizing the upper pouch of the stomach as much as possible, the lower pouch was reefed together and plugged into the crater of the ulcer. By repeated reefing sutures, the lower sac of the hour-glass was simply converted into a solid mass of tissue which was sutured to the liver and its round ligament. An anterior gastro-enterostomy was then established with the remaining upper sac. X-rays showed that total obliteration of the lower part of the stomach continued after operation. Wagner states that the hemorrhages have ceased because the ulcer is packed with the reefed gastric tissue.

(e) *Exclusion with a Fascial Strip.* Baum<sup>3</sup> reports 5 cases in which he passed a strip of fascia to the cardiac side of ulcer of the lesser curvature and buried it beneath the sero-serous suture. A gastro-enterostomy ended this simple procedure. Of the five patients, one died of an acute postoperative gangrene of the lung fourteen days after operation. Three months after operation the four living patients reported themselves free from pain with gains of from 12 to 20 pounds. X-rays showed absolute occlusion of the constricted portion of the stomach in two cases, and in two others passage of slight amounts of bismuth through the constricted area although the main amount of the contrast meal passed through the stoma of the gastro-enterostomy.

All the patients were men between forty and fifty-nine years old. The ulcer was movable in 4 out of 5 cases. In the fifth, it was adherent to the pancreas.

Baum also refers to the report of Kolb (see below) who made the

<sup>1</sup> International Surgical Congress, April, 1914. Zent. f. Chir., 1914, p. 942.

<sup>2</sup> Zent. f. Chir., 1914, p. 1067.

<sup>3</sup> Ibid., p. 273.

most recent collection of all Wilms' cases in which once this tying off of the stomach proximal to an ulcer of the lesser curvature had been combined with gastro-enterostomy.

Archibald,<sup>1</sup> finding an adherent perforating ulcer of the posterior wall and lesser curvature of the stomach, excluded the ulcer-bearing area by tying off the stomach above the ulcer with a fascial ligature. The ulcer was situated 7 cm. from the cardia and 9 cm. from the pylorus. It was densely adherent to the pancreas. It was impossible to do a posterior gastro-enterostomy on account of adhesions. By means of a fascial strip taken from the anterior rectus sheath, the stomach was ligated 1 cm. above the upper limit of the inflammatory mass forming an artificial hour-glass stomach. An anterior gastro-enterostomy was performed on the cardiac half of the stomach. The patient did not do well and, about seven weeks later, at a second operation, a second gastro-enterostomy as near the greater curvature as possible was established. This failed to relieve the patient, and eight days later a jejunostomy was established, under local anesthesia, for the purpose of feeding. In the evening after this there was a large hematemesis; which was repeated on the second day following and she died of inanition and hemorrhage. At the postmortem it was found that the fascial ligature had yielded to the extent of admitting the tips of three fingers into the opening joining the cardiac with the pyloric portion.

**A Unique Case of Volvulus of the Stomach.** A woman, aged fifty-three years, with a history of twenty years' stomach trouble with intermission at intervals, was admitted to the hospital with a diagnosis of gastric ulcer and was awaiting operation for gastro-enterostomy. One evening soon after having had a movement of the bowels, there was sudden onset of intense abdominal pain with collapse. The stomach tube was passed followed by the evacuation of one and a half liters of gastric contents. This, however, did not afford relief. Meanwhile what appeared to be a greatly enlarged loop of intestine developed, reaching from the right iliac fossa up towards the left hypochondrium. There was peristalsis from below upward. With a diagnosis of a volvulus of the sigmoid, the abdomen was opened two and a half hours after onset of symptoms and a volvulus of the stomach was found. Upon disengaging this volvulus which was one of 270 degrees in the direction of the hands of a clock, it became apparent that a distinct hour-glass stomach was present, the point of stenosis of hour-glass constriction being rather near the cardia as a result of a callous ulcer at this point. Below the point of constriction, the stomach was greatly dilated and had sunk down in the abdomen so that the first part of the duodenum was carried along with it and reached up to its junction with the vertical part of the duodenum. The lesser omentum

<sup>1</sup> *Annals of Surgery*, September, 1914, p. 342.



was so contracted between the duodenum and the hour-glass constriction that it served as a short pedicle which formed the basis of the volvulus. After replacing the stomach in its proper position, the abdomen was closed. The patient made a slow recovery and was operated subsequently for the establishment of a gastro-enterostomy. At this operation opportunity was taken for making pictures of the stomach in different stages of volvulus. It was noticeable at this examination that the gastro-colic ligament had an unusually high attachment on the dorsal aspect of the stomach which predisposed to production of volvulus. It also became apparent that, with the volvulus of the stomach, most of the intestine was turned over toward the left also.

The gastro-jejunostomy was made with the lower sac of the hour-glass stomach.

Nine days after operation, colic, with collapse, again developed. It was found that the upper half of the hour-glass stomach did not properly empty into the lower half. At a third laparotomy, therefore, a Heinecke-Mikulicz gastropasty was made at the point of hour-glass constriction. Since that time the patient had been free from complaint.

In a review of the literature, together with a discussion of the mechanics of stomach volvulus, Kocher<sup>1</sup> describes two types of volvulus. One, torsion around the vertical axis of the organ, like the one of his own, which he calls "mesenterio-axial," and a second type which takes place along the longitudinal axis of the organ (volvulus organo-axialis).

In the latter case, it may be either organo-axialis posterior or anterior depending on the direction of torsion.

**Congenital Hypertrophy of the Pylorus.** The articles of Holt,<sup>2</sup> Downes,<sup>3</sup> Lewis and Grulee,<sup>4</sup> and Exchaquet<sup>5</sup> bring the subject up to date, but add practically nothing new. The Rammstedt division of the pylorus down to the mucosa<sup>6</sup> is gaining favor in the cases with extreme debilitation. Care, however, must be taken to avoid entering the lumen of the duodenum close to the pylorus; it is extremely easy to commit this error because of the sudden transition between the thickened pylorus and the paper-thin duodenum. One must also be sure that the divided pyloric muscle surfaces have stopped bleeding before closing the abdomen—the writer has heard of one case which bled to death owing to failure of the operator to realize the importance of taking this precaution.

**Pyloric Exclusion** is still in the case-reporting stage. The results of von Eiselsberg have been given above.

Polya warns against using his modification of the Billroth II method for exclusion of the pylorus. (See also remarks on resection for cancer

<sup>1</sup> Deutsch. Zeitschr. f. Chir., cxxvii, 591. Zent. f. Chir., 1914, p. 1551.

<sup>2</sup> Journal of American Medical Association, lxii, p. 2014.

<sup>3</sup> Ibid., p. 2019.

<sup>4</sup> Ibid., lxiv, p. 410.

<sup>5</sup> Ibid., lxiii, p. 1986.

<sup>6</sup> PROGRESSIVE MEDICINE, June, 1914, p. 99.

by W. J. Mayo below.) He recounts<sup>1</sup> that Reichel,<sup>2</sup> Bergmann,<sup>3</sup> and himself<sup>4</sup> independently recommended the same operation, namely, end-to-side implantation of the cardiac stump of the stomach into the beginning of the jejunum which is brought up through an opening in the transverse mesocolon. Polya had good results with this modification of the von Eiselsberg pyloric exclusion in three cases of duodenal ulcer but later abandoned it because this procedure is more complicated than simple gastro-enterostomy, with ligation of the stomach to the oral side of the ulcer, which he finds most easily accomplished by means of the ligamentum teres of the liver.<sup>5</sup> He emphasizes that his operation should be reserved for cases where only a small stump of stomach is left after resection, because, in those cases in which division of the stomach has been made near the pylorus, the greater curvature easily reaches further to the right than the opening of the stomach into the jejunum. This readily leads to compression of the aberrant loop of jejunum below the site of implantation. Such, indeed, was the finding at autopsy upon a patient of Mutschenbacher's who had died of a vicious circle.

Parlavecchio<sup>6</sup> now employs a tape instead of a silk thread. Randis and Coppolo<sup>7</sup> cover the tape with a layer of organic tissue, omentum or aponeurosis, to prevent adhesions.

Barsony<sup>8</sup> excluded the pylorus fourteen times by means of a silk ligature passed around the antrum; all were later examined by x-rays. Of these, seven were repeatedly examined. In the larger number of cases a high degree of stenosis was obtained, although, at the point of constriction, a small lumen was always present. In some of the cases the artificial stenosis remained permanent.

Guleke<sup>9</sup> reported 11 cases examined from six months to two years after gastro-enterostomy and pyloric exclusion with silk ligature. In 9 of the 11 cases, the pylorus was practically impassable. Guleke recommends this for cases of acute perforated ulcer of the pylorus or duodenum, the probability of leakage being still more diminished by the pyloric exclusion.

**PYLORIC EXCLUSION WITH FASCIAL STRIP.** Kolb<sup>10</sup> collected 19 cases from the clinic of Wilms, in Heidelberg. The operation was performed for the following conditions: Duodenal ulcer, pyloric ulcer of the stomach, gastrectasy, pyloric stenosis from adhesions. The observation of cases was continued as late as four hundred and eighteen

<sup>1</sup> Zent. f. Chir., 1914, p. 420.

<sup>2</sup> Verhandl. d. Deut. Ges. f. Chir., 1908, 1 Teil, p. 211.

<sup>3</sup> St. Petersburg med. Woch., 1909, No. 52.

<sup>4</sup> Zent. f. Chir., 1911, No. 26, p. 894.

<sup>5</sup> Ibid., 1913, p. 1329.

<sup>6</sup> British Journal of Surgery, October, 1914, p. 261.

<sup>7</sup> Loc. cit.

<sup>8</sup> Bruns Beiträge, lxxxviii, Heft 3, p. 473.

<sup>9</sup> Verhandl. d. Deutsch. Ges. f. Chir., 1914.

<sup>10</sup> Bruns' Beiträge, Band lxxxviii, Heft 1.

days after operation. In none of these was the pylorus patent. The strips of fascia are taken from the fascia lata, rather than from the rectus fascia. Kolb draws attention to the fact that, after removal, the fascia shrinks immediately (primary shrinkage), and that after its transplantation, it undergoes still further shrinkage through cicatricial contraction (secondary shrinkage). He believes that exclusion with the fascial strip is the safest and the most advisable method. They tried ligation with the round ligament of the liver in only one case and therefore do not consider themselves in a position to judge of the merits of this method although the result in this case was good. In 2 cases, the ligature of the pylorus was made with a strand of omentum after crushing. One of these cases was lost track of. In the other, the result was satisfactory. To recapitulate, they believe the use of fascial ligature to be the method of choice. Failures of the method are due to improper technique.

Galpern<sup>1</sup> had 12 cases (with fascia) of which 7 had been observed longer than one year. In only one was there the slightest escape of material through the stenosed part of the stomach.

The fascial strip is 2 cm. wide and is taken from the fascia lata, not from the aponeurosis of the abdominal wall.

Roepke<sup>2</sup> reports pyloric exclusion with a fascial strip, according to Wilms, in 7 cases. The strip was 1.5 to 2 cm. broad which is passed around the stomach after blunt dissection of the vessels at the greater and lesser curvatures. The ends are crossed and fastened in place by silk stitches. In order to prevent adhesion between the fascial strip and the adjacent organs, it is buried by sewing the stomach walls on either side of it together over it.

In the discussion which followed, Flörcken reported a case of marked dilatation of the duodenum following fixation of the right kidney for nephroptosis. Relief was obtained by a pyloric exclusion according to the method of von Eiselsberg.

THE BIONDI METHOD OF PYLORIC EXCLUSION. Porta<sup>3</sup> performed this twelve times with satisfactory results.

Kudleck<sup>4</sup> reports 10 cases in which he occluded the pylorus according to the following method: The anterior wall of the stomach was opened 3 cm. from the pylorus through a zig-zag incision down to the mucosa from the smaller to the greater curvature. The latter was then bluntly dissected away from the muscularis, after which the mucosa was reefed by suitably placed cat-gut sutures at two points a little distance from one another. This reefing was still further increased by the placing of three or four button-hole, cat-gut stitches. The infolding was so made that the folds correspond to the longitudinal axis of the stomach. The

<sup>1</sup> Zent. f. Chir., 1914, p. 1416.

<sup>2</sup> Ibid., p. 285.

<sup>3</sup> Deutsch. Zeitschr. f. Chir., Band cxxv, p. 511.

<sup>4</sup> Zent. f. Chir., 1914, p. 283.



seromuscular coat was then closed again. Before operation in all of the cases, there was gastropitosis of more than five years standing in which x-rays showed delayed emptying of the stomach six to seven hours.

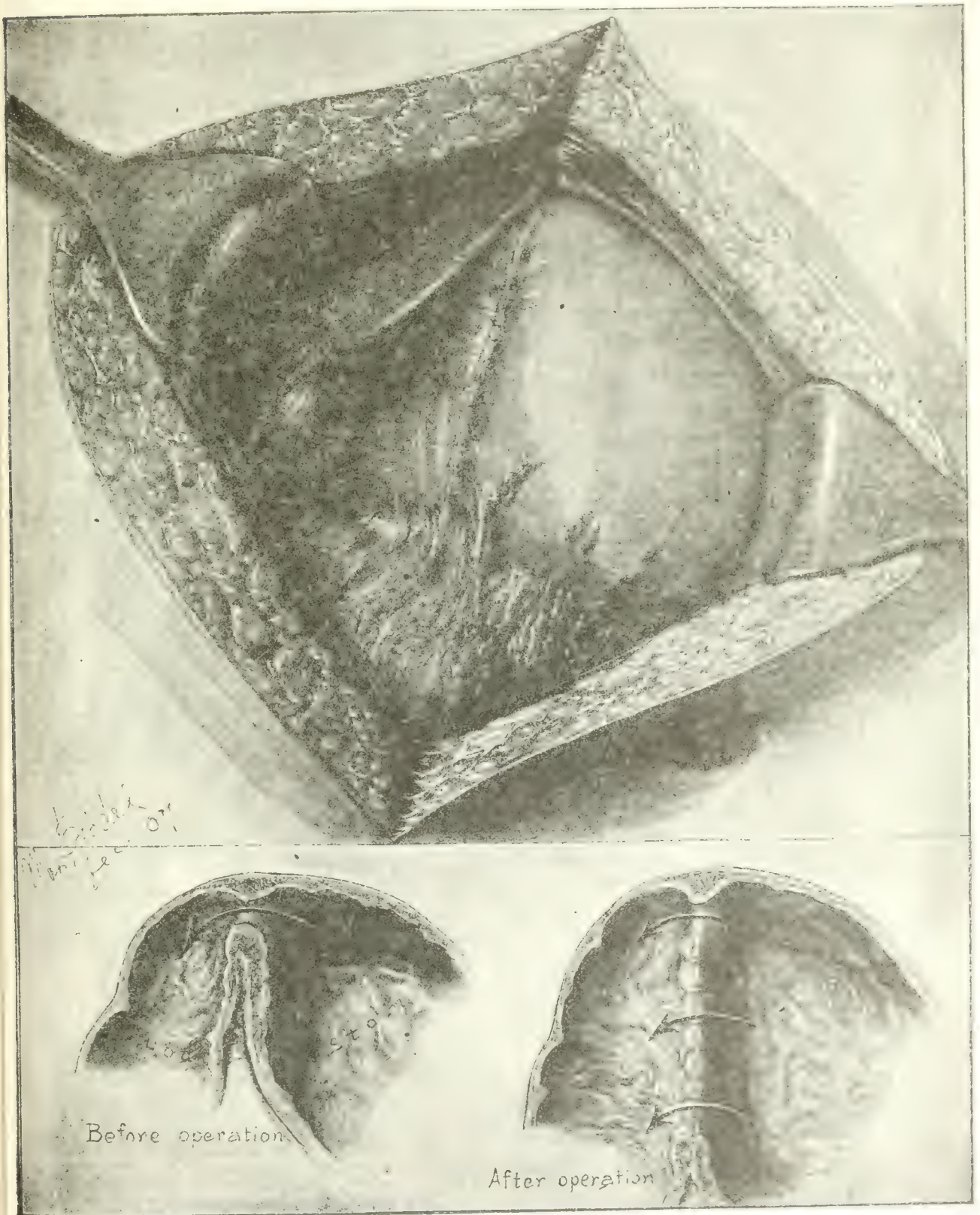


FIG. 25. Operation completed. Showing relative sizes of old and new pylorus. (Finney.)

All of the patients were in a rather emaciated condition and suffered from obstinate chronic constipation. In 9 cases complete relief was obtained; in only one was there persistence of the symptoms, and in this, a sudden collapse of the patient on the table necessitated a hurried and inexact completion of the operation. The x-rays showed that some of the contrast meal passed through the narrowed pylorus. In the other cases it was found that the exclusion of the pylorus was complete. Contrast meal could be seen progressing first toward the pylorus and only after two or three minutes had passed, did it start to leave the stomach through the gastro-enterostomy opening.

Strauss,<sup>1</sup> in experiments on dogs, has modified the Biondi method inasmuch as after incising the serosa and muscularis and shelling out the mucosa he places a free fascial transplant around the tube of mucosa and then buries it, instead of dividing the mucous tube and closing both ends with sutures as Biondi has done. This experiment was made in a series of 16 dogs. At the end of two months the pylorus was found still perfectly closed. In a second series of dogs (12) a silk ribbon (Parlavecchio) was used to constrict the pylorus, no attempt being made to bury it. While the latter method was almost as successful in dogs, nevertheless its application to human beings has the objection that it is bound to give rise to adhesions.

Barr<sup>2</sup> incised the peritoneal and muscular coats of the duodenum, shelled out the mucous membrane, which was then divided between two ligatures. A purse-string suture was then applied to the mucous membrane where it joins the muscularis and each stump was inverted. One of the ligatures slipped off and the stump was simply inverted without further trouble. This accident suggested to Barr that this might be the method of choice. He does not believe that hemorrhage from the cut edge of the mucous membrane would be serious.

**Chronic Gastro-duodenal Ulcers.** W. J. Mayo<sup>3</sup> announces certain changes in the technique of routine operations and the present indications in vogue at the Rochester clinic. Regarding the latter, he says, "At the present time we are excising a considerable percentage of duodenal ulcers when they are situated so that it may readily be done. In our earlier cases, simple excision was practiced and a certain percentage of them failed to obtain relief. It was found necessary to make thorough provision for drainage at the pylorus after excision either by the Heinecke-Mikulicz pyloroplasty or what we have found still better, the gastro-duodenostomy of Finney, which lends itself admirably to the excision of the duodenal ulcer." (See review of Finney and Friedenwald's report below.)

*Change in Technique.* In a small percentage of the cases at the Mayo clinic, of both gastric and duodenal ulcer, there was a recurrence of

<sup>1</sup> Journal of American Medical Association, lxiii, p. 1525.      <sup>2</sup> Ibid., lxiv, p. 506.

<sup>3</sup> Annals of Surgery, August, 1914, p. 224.



symptoms. A small number of these cases were reoperated at the Mayo Clinic, and in each instance the source of trouble was found to be a gastro-jejunal ulcer in the suture line of the original gastro-jejunostomy as a rule due to the sloughing of the continuous sutures of silk or linen which had been used at the first operation. The symptoms were quite like those the patients were suffering from at the time of the primary operation showing that the same disturbance may come from suture ulceration as that manifested by the original lesion. The Mayos have, therefore, abandoned continuous silk sutures in gastro-jejunostomy, and are now using interrupted peritoneal sutures of fine silk (see Fig. 32), with continuous chromic catgut for the inner rows.

“Occasionally fixation of the pyloric end of the stomach in the adhesions around an ulcer has continued to give rise to such pain and distress that it was believed that a recurrence had taken place. In these cases the unilateral pyloric exclusion of von Eiselsberg as a secondary operation gave permanent relief.”

**Pyloroplasty.** Finney and Friedenwald report a series of 100 cases extending over the past 13 years. The immediate operative mortality was 5 per cent., death being due to atrophy of the liver, to bronchopneumonia in very debilitated subjects, to diabetes, and to chronic nephritis and uremia. The results of the operations during the first year show an unsatisfactory condition in five instances (6.1 per cent.). Of the total 100 cases, the final result of 17 was unknown, while 5 died immediately after operation, as just said. This left 78 cases. Of these, results were satisfactory in all but 5 (6.4 per cent.). That is satisfactory in 93.6 per cent.

X-ray plates made in 5 cases, all of which had been operated upon over one year, showed the stomach to be functionating in a normal way and emptying itself at a normal rate.

The chief *indication* for the operation, according to Finney, is for the relief of pyloric stenosis due to chronic ulcers situated at or near the pylorus and on either side of it, or resulting from cicatricial contraction following the healing of such ulcers. It is often a useful procedure in cases of hemorrhage due to gastric ulcer on the lesser curvature, or to duodenal ulcer which cannot be controlled medically and which threatens the life of the patient, as well as in the chronic dyspepsia due to ulcers which have not been relieved by medical treatment.

*Contraindications* to the operation are: Inability to mobilize the duodenum when adhesions are too dense; in atony or gastropptosis with slight motor insufficiency, or in nervous dyspepsia.

The special *advantages* of the operation lie in the possibility of excising all ulcers in the anterior walls of stomach or duodenum after direct inspection of the part affected; also application of treatment to ulcers in the posterior wall. It does not greatly disturb the normal relation between the stomach and intestine as is the case in other operations.



The authors compared the gastric secretions in 4 cases of pyloric stenosis due to ulcer before the operation with those obtained one and two months after the operation. In every case the total quantity of acid, as well as the percentage of free hydrochloric acid which was extremely high before operation, was regularly reduced to normal by the end of two months, after which it continued to remain stationary.

Of the cases requiring secondary operation—gastro-enterostomy; in one, there occurred a pyloric obstruction due to adhesions produced by cholecystitis eleven years after the pyloroplasty. In the second, a duodenal ulcer formed four years after the pyloroplasty. In the third, an infected suture (linen thread) caused early obstruction at the site of the pyloroplasty; and, in the fourth, a duodenal ulcer formed after a year and a half. In all of these cases secondary gastro-enterostomies were performed which gave entire relief. In both of the cases where a duodenal ulcer occurred, an attempt had been made at the original operation to excise a duodenal ulcer, but, owing to the fact that it was so situated that it could not be entirely excised, it was more than probable that in one of the cases at least there was a direct recurrence. In the other, the second ulcer appeared so far removed from the site of the first as to give the impression that it was an independent ulcer.

**IMMEDIATE EFFECT OF THE OPERATION.** Vomiting and diarrhea were brought on by errors in diet. Regarding the postoperative diet, Finney states: "Inasmuch as the operation is performed in most instances upon patients affected with pyloric obstruction, and often after having this condition for years, it is easily understood how, on account of the rapid passing of the gastric contents through the stomach, a weakened intestine may be overtaxed, and intestinal indigestion and diarrhea be produced. On this account, as well as because the stomach has, in most instances, temporarily lost its tone, and inasmuch as, in some instances, portions of ulcers have not been entirely resected, due to their location and extent, we have found it advisable to regulate the diet following immediately upon operation and continued on for several months. For two days after operation nourishment is administered only by means of rectal alimentation. Normal saline is begun immediately after operation, with nutrient enemata every four hours on the second and third day. On the third day, egg albumen is given in teaspoonful doses gradually increasing to one-half ounce every two hours. For the rest of the dietary details recommended, the reader is referred to the original article."

**THE TECHNIQUE OF THE OPERATION.**<sup>1</sup> The technique of the operation may be described as follows: Adhesions binding the pylorus to neighboring organs should be thoroughly freed, as well as the pyloric end of the stomach, and first portion of the duodenum.

The thoroughness with which the pyloric end of the stomach and the upper end of the duodenum are freed determines largely the ease and success of the operation. Much advantage is gained from this so-called

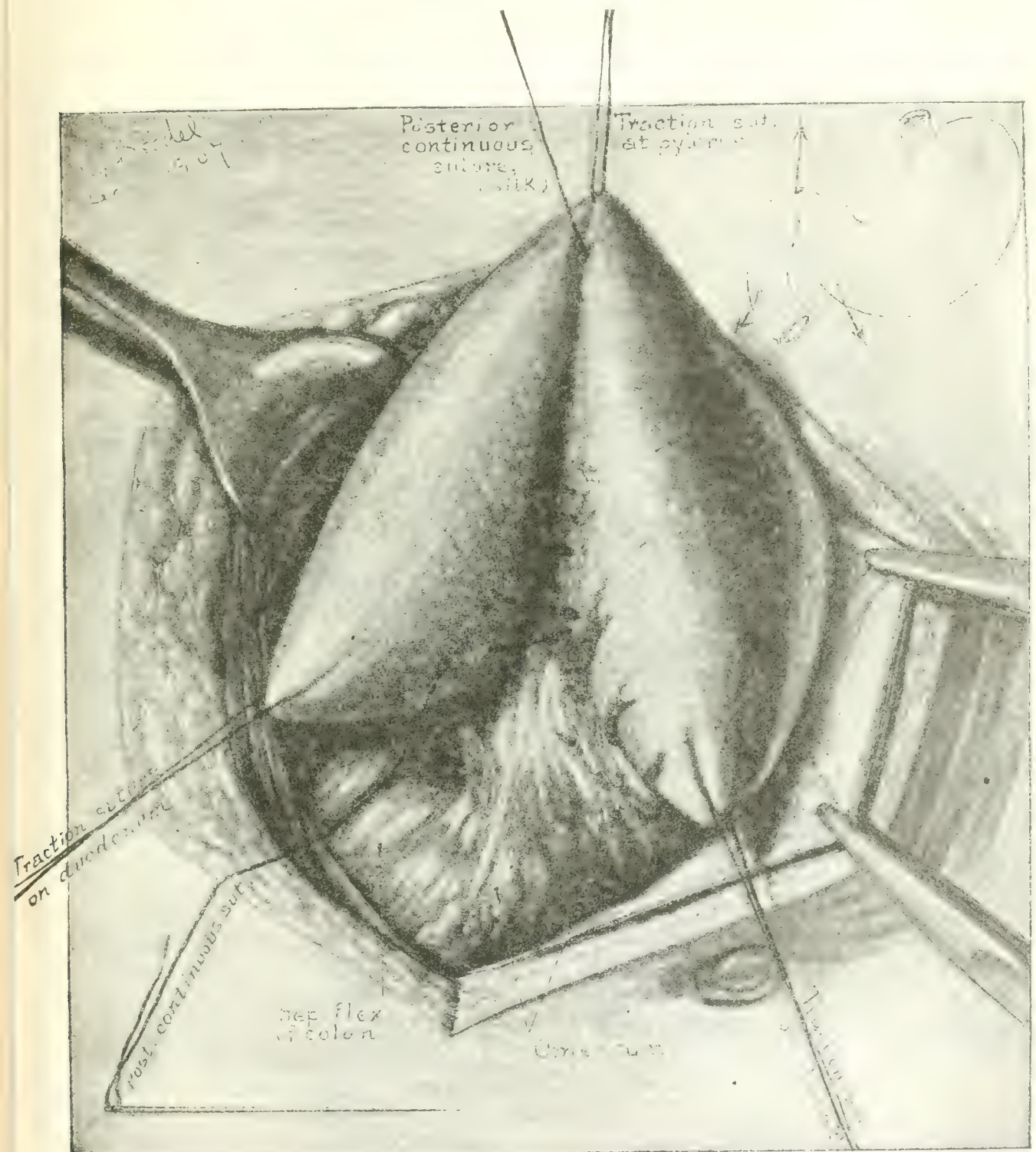


FIG. 26.—Showing traction stitches in pylorus, stomach, and duodenum. Posterior line of suture nearly completed. (Finney.)

mobilization of the duodenum. Kocher later emphasized the great importance of this procedure. A suture to be used as a retractor is taken in the upper wall of the pylorus, which is then retracted upward



by means of this suture. A second suture is then placed in the anterior wall of the stomach, and a third in the anterior wall of the duodenum

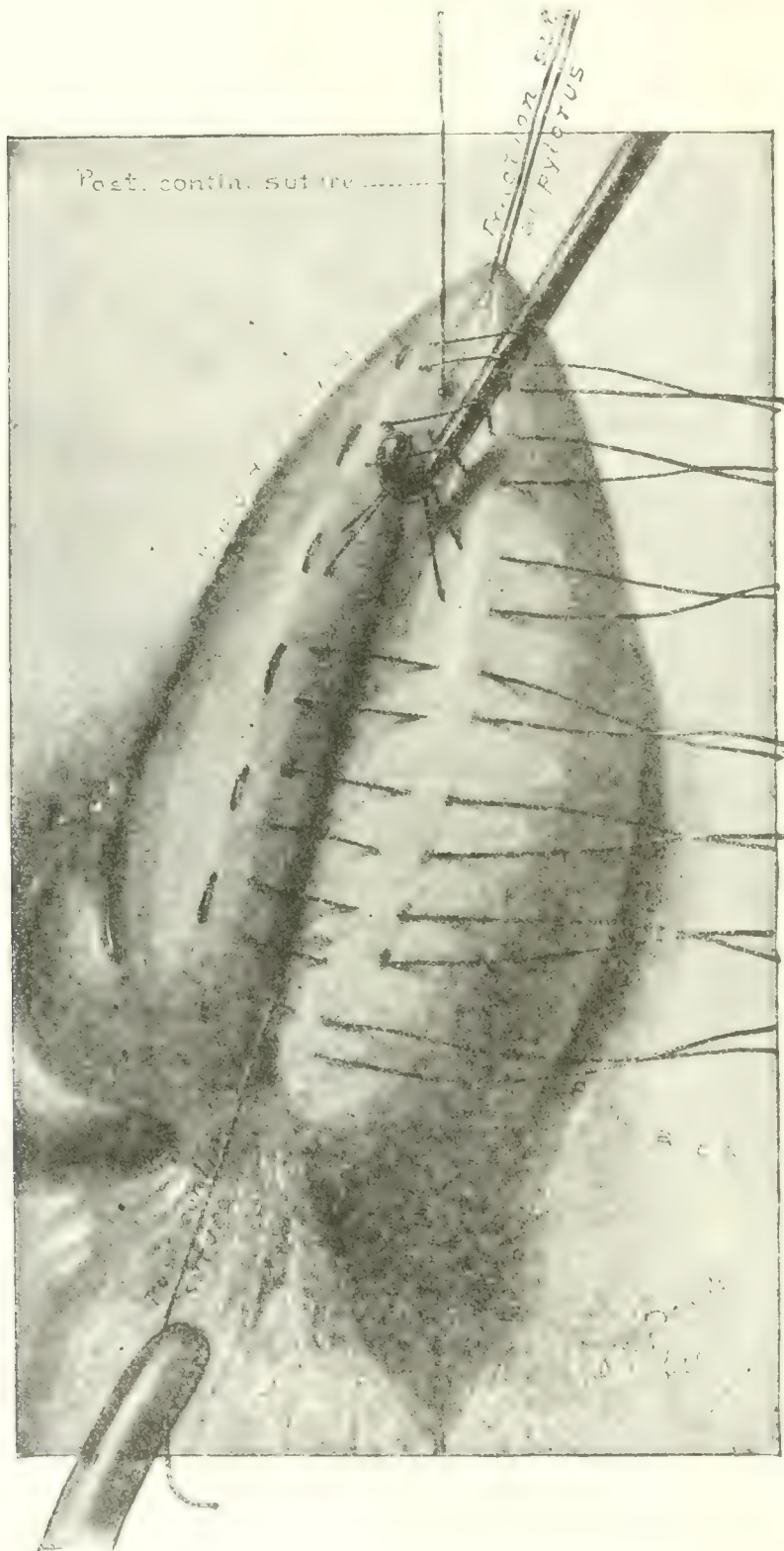


FIG. 27.—Posterior continuous suture placed and tied. Ends left long as retractors. Anterior row of mattress sutures placed but not tied. (Finney.)

at equidistant points from the suture just described in the pylorus. The second and third sutures are taken as near the opposing free borders



of the stomach and duodenum as possible, and mark the lower ends of the gastric and duodenal incisions respectively (Fig. 25).

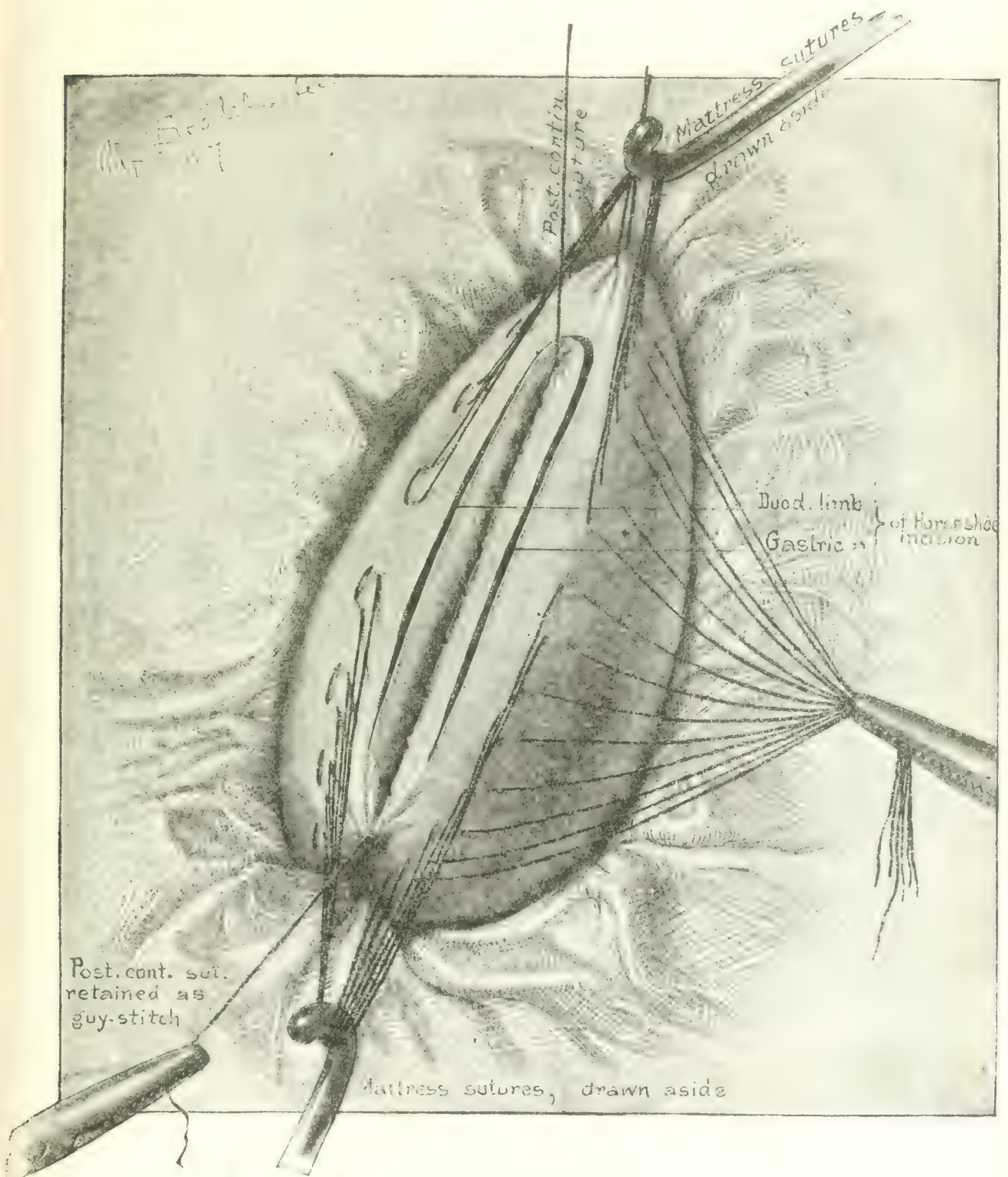


FIG. 28.—Anterior mattress sutures retracted. Incision completed through the anterior gastric and duodenal walls. (Finney.)

Traction is then made upward on the pyloric suture, and downward in the same plane on the gastric and duodenal sutures. This keeps the stomach and duodenal walls elevated and taut, and allows the plac-

ing of the subsequent sutures with greater facility than if they remained retracted and relaxed. The peritoneal surfaces of the duodenum and stomach along its greater curvature, are then sutured as far posteriorly as possible. For this row the continuous silk suture is to be preferred.

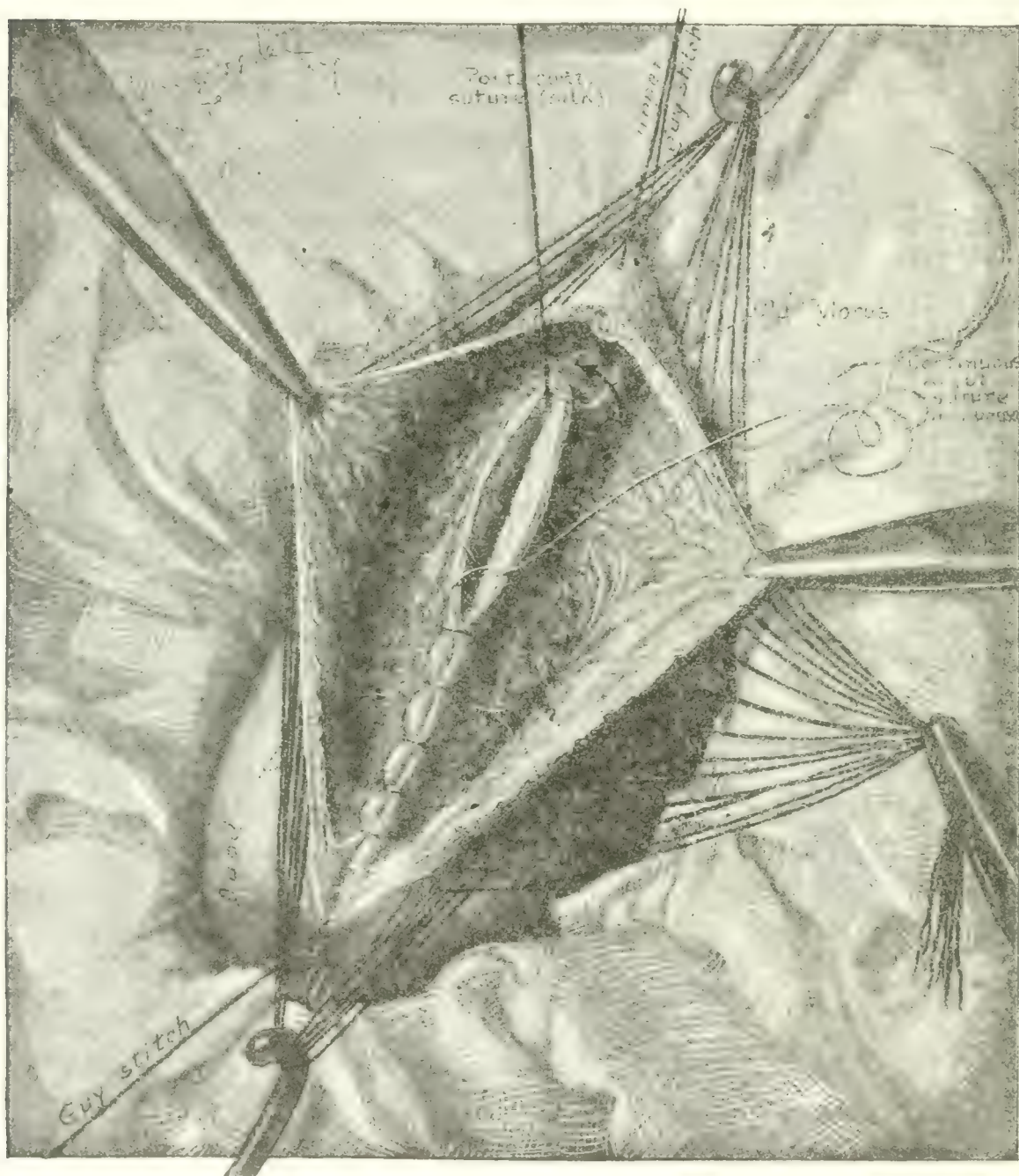


FIG. 29.—Anterior gastric and duodenal walls retracted, showing buttonhole suture of catgut partly placed in the free borders of the posterior walls. (Finney.)

After the posterior line of sutures has been placed and tied, an anterior row of mattress sutures is taken, which are not tied. These sutures after they have been placed are drawn aside, thus exposing the line of incision (Fig. 26).

After all the anterior stitches have been placed and retracted, the



incision is made in the shape of a horseshoe. The anterior and posterior lines of sutures should be placed far enough apart to give ample room for the incision to be made between them. Beginning in the gastric wall, the incision is carried upward to and through the pylorus, and around into the duodenum (Fig. 27). Hemorrhage is then stopped. Scar tissue or active ulcers present in the gastric or duodenal anterior wall may be excised through this incision.

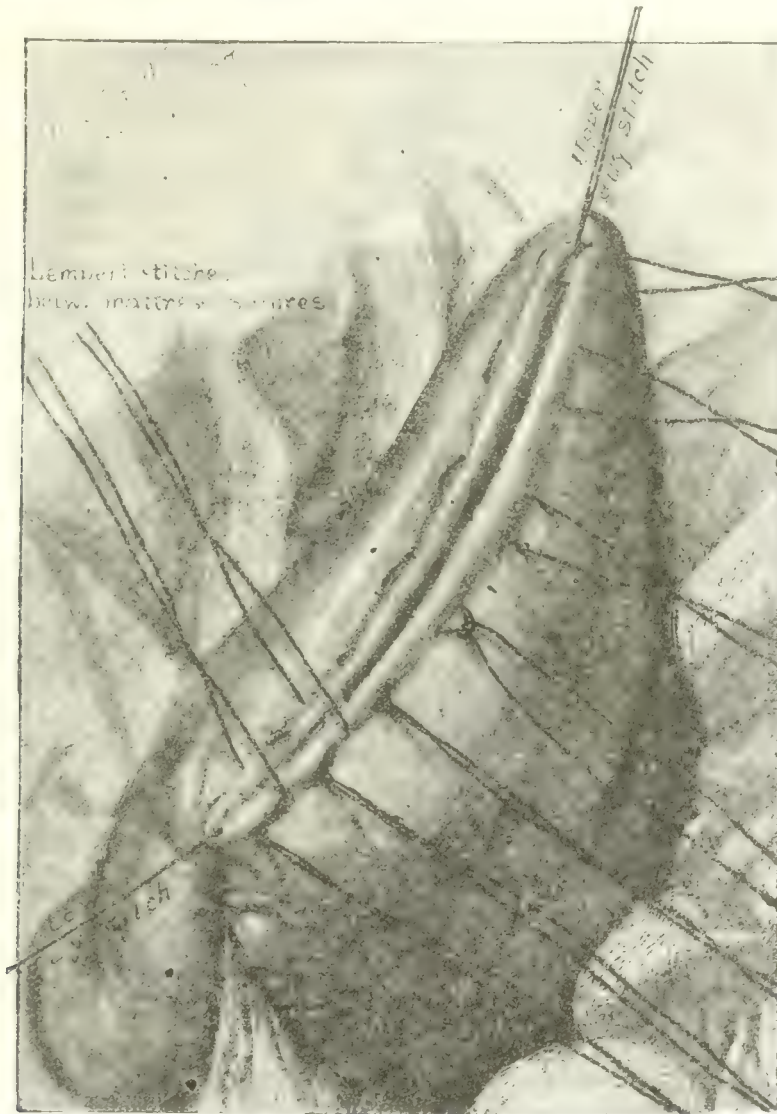


FIG. 30.—Mattress sutures previously placed now tied. Alternate Lemberts placed between the mattress sutures. (Finney.)

Those in the posterior wall we have been treating of late just as other chronic ulcers, *i. e.*, excising the overhanging edges of mucous membrane, and incising the dense fibrous base; care being exercised to avoid perforation of the posterior wall of the stomach and to stop all hemorrhage by ligature or suture.

The opportunity thus afforded to explore digitally and inspect the ulcerated area and then excise it through this incision is, in our judgment, one of the strongest points in favor of the operation.



A continuous catgut suture is now taken through all the coats of the stomach and duodenum on the posterior side of the incision in order to reinforce this line of sutures (Fig. 28). The anterior sutures are then straightened out and tied, and the operation thus completed. The mattress sutures may be reinforced with as many Lembert sutures as may be thought best (Fig. 29). All the stitches are thus placed and the posterior row tied before the bowel is opened, and it remains open only long enough to control the hemorrhage and excise any ulcer that may be present, thus giving the minimum of exposure of infected surfaces.

The size of the newly formed pylorus may be made as large or small as desired. Unless the stomach is very much dilated or has descended to an unusual extent, the lower limit of the new pylorus will be found to be at or near the level of its most dependent part.

**Gastric Cancer.** GASTRIC CANCER IN THE YOUNG. Of 721 cases of carcinoma of the stomach at the Mayo Clinic and Augustana Hospital (Ochsner Hospital in Chicago), Smithies<sup>1</sup> reports 16 cases in patients under the age of thirty-one years. In all, there was a history of protracted gastric complaint.

PROGNOSIS IN CARCINOMA OF THE STOMACH. Anschütz<sup>2</sup> states that only 2 or 3 per cent. of gastric carcinoma obtain a three-year cure. This is accounted for by the fact that only half the cases of carcinoma come to the surgeon, and, of these, only a quarter are suitable for resection. The operative mortality of resection is 18 to 20 per cent.—no worse than resection for carcinoma elsewhere. Of those surviving the operation, at least 30 per cent. have a three-year cure. Among the cured patients are twice as many women as men. Carcinoma in younger years is no more malignant than later. Part of the cases had histories extending over a year. Permanent cures have followed operation in cases with extreme grades of cachexia (hemoglobin, 25 per cent.). In 33 per cent. of the cured cases, adhesions were found, and in some of these extremely dense adhesions to the pancreas, liver and colon were present. Anschütz lays especial emphasis on the fact that adhesion to the colon *per se* does not constitute an inoperable condition. The microscopical picture is not of value in prognosis. The adenomatous form of carcinoma is found to be more benign than the scirrhus.

Küttner, of Breslau, before the German Surgical Congress of 1914 reported on 1100 operations for disease of the stomach during the past six and three-quarter years. The stomach cases comprised 10 per cent. of the surgical work at Breslau. Two-thirds of these represented operations for carcinoma, and, of the latter, only 20 per cent were suitable for radical measures. Of the operable cases, a relatively large number (196) were resections. In 15 per cent. of the carcinoma cases there was a history of previous gastric disturbance of such long standing that it

<sup>1</sup> Journal of American Medical Association, lxiii, p. 1839.

<sup>2</sup> Deutsch. Ges. f. Chir., 1914.

could not have been of carcinomatous origin. Whether the symptoms were caused by gastritis or achylia could not be determined.

The operable cases generally had a longer history of gastric symptoms than the inoperable ones.

Thus, of 400 instances in which the patients were able to give an accurate account of the beginning of their symptoms, the operable cases gave a longer previous history than the inoperable ones. In other words, the duration of symptoms had no relation to the operability of the case. Strange to say, the greater proportion of patients with inoperable conditions came from private practice. An interesting example was cited to show how extrapyloric cancer of the stomach can exist for a long time without attracting attention. A woman was in the hospital for a year on account of multiple cysts of the upper third of the femur, first on one side and then on the other. Finally she died. Autopsy revealed that the cysts were metastases from a gastric carcinoma which had existed entirely unsuspected during life.

As a means of diagnosis, the *x*-rays proved disappointing, except where it demonstrated the existence of inoperable involvement.

The Gluzinski method of differentiating between cancer and ulcer proved fairly reliable. Küttner insists that there is no accurate clinical means of distinguishing between callous ulcer and carcinoma. Often at operation such a diagnosis is impossible. Küttner does not believe in the frequency of carcinomatous change in callous ulcers. However, he resects in the presence of every tumor-forming callous ulcer because of the impossibility of proving that it is not of a carcinomatous nature. Of 130 cases of simple gastric ulcer, there were only 2 in which carcinoma subsequently developed, and, in these, the ulcer was of the callous type.<sup>1</sup>

The American idea of malignant change in chronic gastric ulcers, emanating chiefly from the Mayo Clinic and from Rodman, is upheld by Friedenwald and by a recent report from the Minnesota centre.

From his study of 1000 cases of carcinoma, Friedenwald<sup>2</sup> states that, inasmuch as the early diagnosis of carcinoma of the stomach is still so uncertain, exploratory incision should be urged on all persons over forty years of age having gastric symptoms which are not relieved by a few weeks treatment, especially if there is much loss of flesh and absence of free hydrochloric acid in the gastric contents and occult blood in the stools. He also advises excision of gastric ulcers to prevent carcinomatous change.

The pathologists at the Mayo Clinic have found that of 399 specimens obtained by resection of gastric carcinoma, in 67.4 per cent. of

<sup>1</sup> A similar report was made from Sauerbruch's clinic, namely of 116 cases of gastric ulcer in which operation was made, in only one was there secondary development of carcinoma. (Billeter, Bruns' Beitr. z. klin. Chir., Band xc, Heft 2.)

<sup>2</sup> American Journal of Medical Sciences, November, 1914.

the cases a pre-existing ulcer from which the cancer had sprung could be demonstrated, while in 42.6 per cent., the previous ulcer formation was demonstrated. The autopsy findings in 46 cases of gastric cancer showed quite different percentage. In 38 of these (82 per cent.) the evidence of ulcer previous to cancer formation could not be proved.

Speaking of the *two-stage operation*, W. J. Mayo<sup>1</sup> says: "In our clinic we have in the last fifteen years made a number of the two-stage operations for cancer of the stomach, and, of these, not one patient died as a result of the resection. Standing alone this would seem to be a strong, if not an absolute, indication for the two-stage operation. But an examination of the facts concerning these cases leaves the indications less clear, since they were in a sense selected from a number of patients on whom we could have done a primary resection and who were subjected to a gastro-enterostomy with the intention of following this procedure by resection, but who, for one reason or another, never came to the radical operation. (1) Some of these, who were in a most serious condition, died following the gastro-enterostomy. They would, of course, have died if a primary resection had been made instead of a gastro-enterostomy, but the resection received the benefit so far as statistics were concerned. (2) Some of the patients, especially those with large ulcerating cancerous masses, did not sufficiently improve after the gastro-enterostomy to enable them to submit to a second operation, again bettering the statistics of resection by this elimination. (3) An occasional patient would improve so greatly following gastro-enterostomy that a radical operation would be refused until too late. Another fact of great importance was the occasional delay before the second operation, resulting in infection of vascularized adhesions with carcinomatous cells."

It is Mayo's impression that the percentage of five-year cures in the two-stage group have not been as high as in the one-stage operations. He considers that the two-stage operation is one which should not be generally adopted, but should be reserved for the occasional case in which the general condition of the patient, rather than the local condition of the tumor, furnishes the vital indication. Under such circumstances, he employs the two-stage operation believing that an occasional case is carried to a successful termination in which the patient might have been lost following the one-stage operation. In the two-stage operation it is necessary to plan the gastro-enterostomy opening so that it will be in such a situation as not to cramp or hamper the subsequent resection. Mayo states that the mortality depends more upon the cases which will be accepted for operation than upon any other one fact. Thus they had mortalities in some years, following partial gastrectomies, as low as 6 per cent.; in other years, with an increasing experience and improved technique, a mortality of twice that or even more, due to

<sup>1</sup> Surgery, Gynecology, and Obstetrics, December, 1914, p. 683.



the fact that the cases which were accepted for operation would previously have been subjected to a palliative gastro-enterostomy. He answers the question, "should patients with a bad cancer of the stomach be subjected to radical operation?" as follows: "In view of the fact that some of these patients, especially those with large fungating growths, have lived beyond the five-year limit, the operation upon patients with advanced cancer of the stomach is justified. Furthermore, even if all the glands cannot be removed at such a resection, nevertheless the patient averages a year or more of very comfortable existence. In some cases the irremovable glandular hyperplasia is the result of infection rather than metastasis. These experiences, acknowledged to be accompanied by a high mortality, have led us to extend the radical operation to a group of cases which we would have formerly considered inoperable."

"The most serious technical question concerns the form of reunion of the gastric stump to the intestine after the removal of extended disease. The gastric stump is small; it has already been seriously devitalized, and the gastro-enterostomy still further devitalizes the already damaged gastric wall. This is especially true of the Billroth II method, that is, complete closure of the duodenal and gastric stump with an independent gastro-jejunostomy. The Polya<sup>1</sup> method for uniting the stomach and intestine after resection, according to Billroth II, has been tried out in 12 cases at the Mayo Clinic, with one death from pulmonary embolism, the autopsy showing perfect condition of the operative field.

Thus, after division at the duodenum, Polya applies a seroserous stitch between the stomach and jejunum which has been brought up, before proceeding to resection.<sup>2</sup> Instead of this, the Mayos remove the diseased part of the stomach completely before starting their serous stitch (Fig. 32), maintaining asepsis by a crushing clamp and cauterizing the cut ends of the stomach and duodenum with the actual cautery (Fig. 31) to prevent implantation of the carcinoma cells upon these raw surfaces. The method of uniting the cut end of the stomach to the jejunum is performed in quite the same way as the ordinary gastro-enterostomy. The diameter of the end of the stomach is very large and can easily be diminished by placing the sutures in such a manner as to take a proportionately greater bite of the stomach than of the intestine, thus gradually reducing the lumen of the stomach as the suturing progresses. Before the inner through and through sutures are placed, the stomach and intestine are grasped with elastic holding clamps to prevent soiling; the inner row of sutures is then run entirely around, and the outer row is completed (Fig. 33). The entire anastomosed end

<sup>1</sup> See *PROGRESSIVE MEDICINE*, June, 1912, p. 93, for certain slight differences in technique.

<sup>2</sup> *Ibid.*, Fig. 31.

of the stomach is then drawn down below the transverse mesocolon and the margins of the opening of the transverse mesocolon are carefully attached by a number of sutures to the wall of the stomach (Fig. 34). Fine silk is used for the peritoneal-muscular sutures and chromic cat-gut for the through and through inner row. In closing, Mayo points out the obvious advantages of this operation, firstly that it saves the time consumed in closing the end of the stomach, and secondly in cases

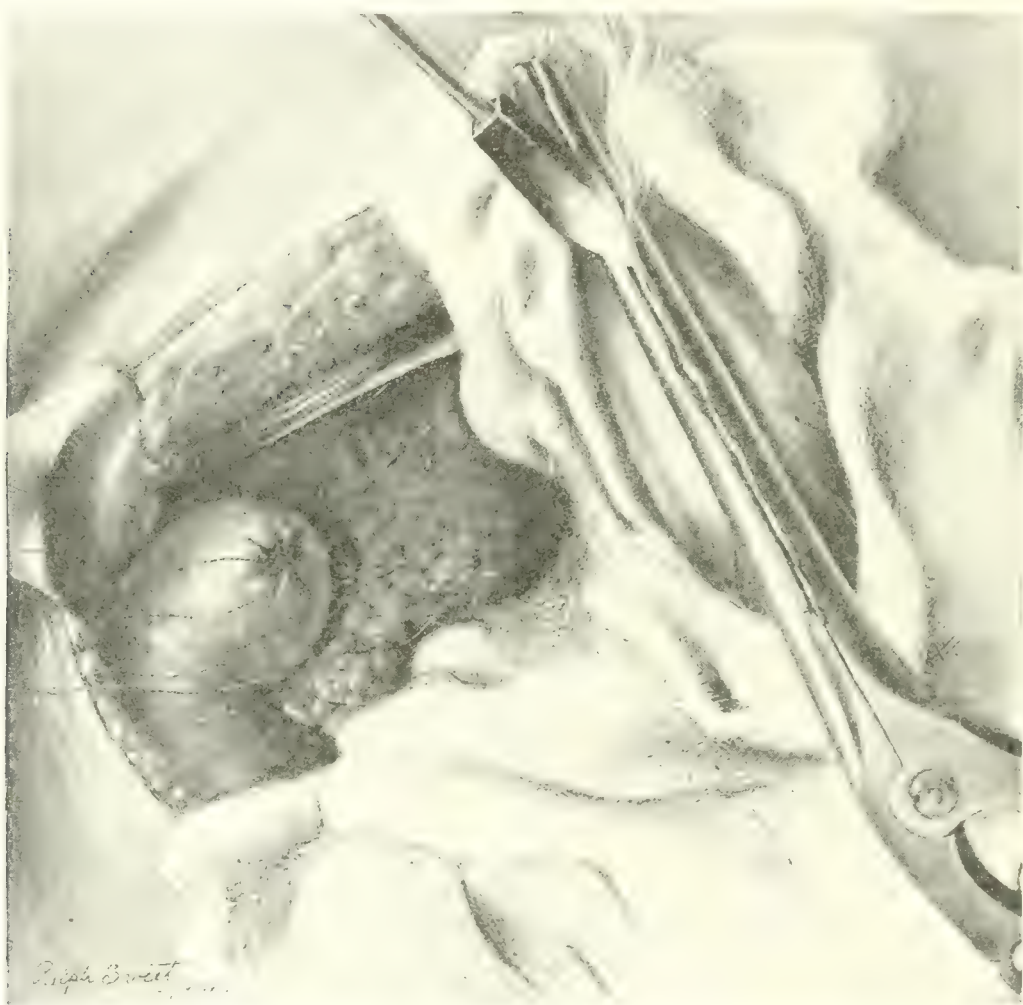


FIG. 31.—Crushing clamp on the stomach. Cautery used to sterilize and prevent carcinomatous implantation. Stump of duodenum closed. Sutures placed to turn the duodenal stump into the denuded head of the pancreas. (Mayo.)

in which only a small pouch of the stomach is left, this procedure is very much easier than an independent gastro-enterostomy. He says "Unless further experience shows some contraindication, I predict for this procedure a large field of usefulness, if it does not become the method of choice."

The Polya-Reichel-Bergmann operation is being done in England although the English authors apparently devised the method anew without knowing of its previous existence, since they give no credit.



Thus, Moullin,<sup>1</sup> after performing a subtotal gastrectomy for carcinoma, so that only a small portion of the cardiac end was left, closed the upper portion of the incision in the stomach with a double row of sutures. The lower end was sutured to the edges of an incision of corresponding length in the jejunum so as to form a gastro-jejunostomy.

Sherren also published an accurate account describing how he performed the operation. (See review of his discussion of Eiselsberg's paper at the beginning of this section.)

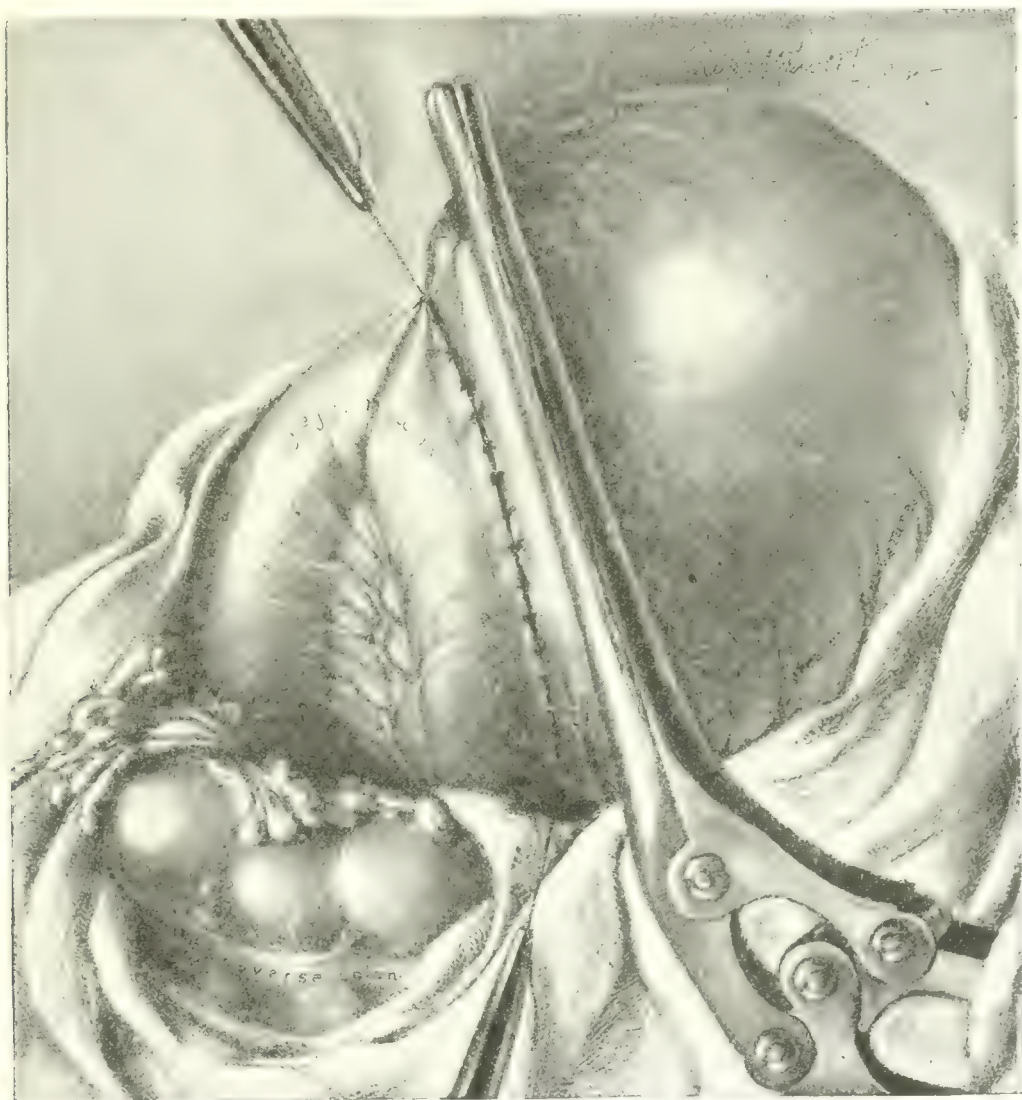


FIG. 32.—Upper jejunum six to twelve inches from origin brought through an opening which has been made in the transverse mesocolon and united by outer row of seromuscular silk sutures to the posterior wall of the stomach. (Mayo.)

**Increased Mortality in Resections of the Stomach where the Pancreas is Partly Resected or Sutured to the Duodenal Stump.** Contrary to the experience of the Mayos, Willy Meyer and others, Küttner,<sup>2</sup> of Breslau, reports that he is becoming very conservative in using the pancreas to

<sup>1</sup> *Lancet*, May 16, 1914.

<sup>2</sup> *Zent. f. Chir.*, 1914, p. 981.

cover the stump of the duodenum in resections of the stomach according to the Billroth II method. He found, among 170 resections during the past six years, that operations in which the pancreas was either resected or included in the suture showed double the mortality (36 per cent.) of



FIG. 33. Crushing clamp removed from the stomach and holding clamps applied to jejunum and stomach to prevent soiling. (Mayo.)

those operations in which the pancreas was not touched (18 per cent.). Küttner believes that this difference is not alone due to the fact that in the former group of cases a more extensive operation was necessary. In the group in which the operative measures had affected the pancreas



there occurred three causes of death which were not observed in those dying after operations in which the pancreas had not been touched. In the former group, at autopsy he found cases of fat necrosis; secondly cases of rapidly fatal progressive peritonitis with the same type of hemorrhagic exudate as found in those with fat necrosis, and, lastly,



FIG. 34.—Anastomosis completed by an anterior row of seromuscular silk sutures. Anastomosed end brought through the opening in the transverse mesocolon and margins of opening sutured to the stomach. (Mayo.)

fatal cases without any pathological findings at autopsy after quite simple operations in which no shock had been produced but which gave exactly the same clinical picture as that observed in the cases with fat necrosis. Küttner believes the fatal cases with hemorrhagic exudate, with or without fat necrosis, were surely of pancreatic origin. In the last group of cases he considers this to be doubtful. In short, he

considers it better to leave the pancreas alone whenever this is possible, although partial resection on account of carcinomatous involvement should not be shunned.

**Advances in the Röntgen Diagnosis of Duodenal Ulcer** have been made through improvements in technique. From what is written below, the reader will appreciate that the direct examination of the duodenum has made such unquestionable progress that it has supplanted the indirect one.

The recently published paper by Carman<sup>1</sup> was reviewed in the December (1914) number of *PROGRESSIVE MEDICINE*, p. 63. George and Gerber,<sup>2</sup> in a still later paper controverting many of Carman's views, point out the inadequacy of the indirect method. For example, that gastric hyperperistalsis was present in only 57 per cent. of the proved duodenal cases of Carman, while, on the other hand, it can undoubtedly be produced by other conditions than duodenal ulcer, such as pyloric stenosis, from early carcinoma and abnormal nervous influences.

The six-hour bismuth residue was present in only 36 per cent. of duodenal ulcer cases (Carman). Holzknecht and Hand found this in only 20 per cent. of their duodenal ulcer cases.

Diverticulum of the duodenum is so rare that it is not a dependable sign. In addition to this, George and Gerber believe that long-continued pull of adhesions against the duodenal wall will cause a diverticulum.

George and Gerber disagree with Carman's ideas about the relative value of defects in the duodenal cap. They insist that the problem is largely one of careful and exact technique. They say "What we try to show in every instance is either a normal duodenum, or the exact size, extent and character of the actual duodenal ulcer. The entire problem revolves about the method of study of the duodenum." They find the fluoroscopic method entirely unsatisfactory, and state that only with the plate method carefully carried out, can the duodenum be demonstrated in its entirety. (They do not deny the value of *fluoroscopic* study of the gastro-intestinal tract, merely of its inadequacy in duodenal conditions.) They employ serial Röntgenography, but this does not necessarily mean the taking of an excessively large number of plates; only enough plates are taken to convince the investigators of either the normal position of the duodenum or its constant abnormal condition. "No set rules can be given as to the position of the patient during examination. All positions—prone, standing, and lateral—may have to be used in order to obtain the desired information. The exact procedure to be followed must be worked out in each individual case as it goes along. This requires the use of rapid developers and the development of plates constantly during the course of the examination. While this is a more troublesome process than the indirect method,

<sup>1</sup> *Journal of American Medical Association*, 1914, lxii, p. 980.

<sup>2</sup> *Surgery, Gynecology, and Obstetrics*, September, 1914, p. 395.



the more accurate results obtained make it certainly worth the slight extra trouble and expense. George and Gerber claim that they were the first to emphasize the value of the lateral view in studying the duodenum. They believe that this is the most important single method known that will adequately demonstrate the duodenum in every instance. The technique is simple. The patient lies on the right side upon a small plate with an intensifying screen. The rays enter the left side of the patient. It is advisable to use the smallest cone and diaphragm obtainable, and the cone must be placed almost in contact with the left side. The length of time of the exposure depends upon the



FIG. 35.—Lateral view of normal duodenum in a man weighing over 200 pounds. *A*, first portion of duodenum; *B*, descending duodenum; *C*, transverse duodenum. (George and Gerber.)

size of the patient. In general, it should be about twice as long as is necessary to obtain a satisfactory plate of the same patient in the prone position.

With this technique, not only the first portion of the duodenum, but the descending duodenum, and in many instances the transverse portion are readily brought into view (Fig. 35). In well-nourished persons this position is the only one that will bring out the first portion of the duodenum satisfactorily. These people usually have the steer-horn type of stomach with the pylorus and duodenum held over the right, behind the antrum. These regions are not brought well into view when plates are taken, or fluoroscopic examination is made, in either the prone or standing position.

Likewise, the lateral position is of value in those cases where there is pylorospasm. Occasionally it may be necessary to wait an hour or more, and, in rare instances, to make another examination on another day in order to obtain a view at a time when the spasm is relaxed. Then the plate will reveal a filling out of the duodenum so that the investigator can determine whether or not the spasm is the result of duodenal ulcer.

George and Gerber insist that if buttermilk is used (as a medium) and the lateral position is applied, the duodenal cap can be demonstrated in every instance if the duodenum is normal and if enough plates are taken. There is absolutely no exception to this statement. In the steer-horn stomach (in contrast to the fish-hook stomach), the duodenum will not come into view in either the prone or standing position, and in these especially is the lateral view most helpful.



FIG. 36.—A characteristic ulcer of superior border of duodenum. A, first portion of duodenum. (George and Gerber.)

The deviation from the normal contour must be constant. "One plate showing a definitely normal cap rules out the possibility of indurated ulcer even though all other plates show apparent abnormalities.

"Spasm is an important source of error, but at sometime during examination, especially with one of the lateral views, a normal cap does obtain. Pressure from other organs or from abnormally placed bloodvessels will occasionally distort the cap; but it will always be smoothed out in some one of the positions."

When gall-bladder adhesions are present, the fixation of the duodenum and antrum is especially demonstrable by manipulation under the fluoroscope. At times these adhesions will produce definite serrations.



The enlarged gall-bladder may leave a concave impression upon the duodenum. Sometimes the evidence of gall-bladder adhesions will be present, together with deformity of the duodenal ulcer. Such cases are often confusing.

"The duodenal ulcers themselves usually show a characteristic bismuth deformity of the cap on one side, with an incutting on the opposite side very similar to the incisures of the greater curvature seen with gastric ulcers (Fig. 36)." Dr. W. J. Mayo's article<sup>1</sup> regarding the pathology of duodenal ulcers is referred to in which he calls attention to the characteristic and abundant scar-tissue formation in the deep layers, out of all proportion to the minute mucosal defect. George and Gerber state: "It is just this disproportionately big cicatrix that we demon-



FIG. 37.—A, first portion of duodenum, containing an ulcer. Arrow points to bismuth entering mucosal defect, which was pin-point in size. (George and Gerber.)

strate by its effect in deforming the contour of the bismuth mass. Recently, in an increasingly large proportion of these cases, we are beginning to show not only the effect of the cicatrices, but the actual mucosal defect itself, small and thin. When careful plates are taken, especially in the lateral position, a tiny stream of bismuth can be frequently found entering the actual crater of the ulcer. We have demonstrated this actual mucosal defect in a case where it was almost of pin-point size (Fig. 37). We thus see that the positive diagnosis of duodenal ulcer depends upon the actual demonstration by the plates of a characteristic deformity of the duodenum due to connective-tissue

<sup>1</sup> Reviewed in *PROGRESSIVE MEDICINE*, June, 1914, p. 119.

formation, and, if possible, the demonstration of bismuth entering the actual defects of the mucous membranes."

The authors are positive that they can demonstrate the existence of duodenal ulcers, both of the sort which produces peritoneal scarring and also of those the existence of which is only determined by the surgeon through palpation. They state that the only type of duodenal ulcer which cannot be shown by *x*-rays is the simple variety such as is found at autopsy in severe toxic conditions, for example, uremia, or the toxemia following severe burns. Their series reported comprises 82 operated cases over a period extending from September 1, 1912, to April 15, 1914. Out of this number, a correct diagnosis of duodenal ulcer, with its exact location and extent, was made in 78 cases.

As regards the negative aspect of the method, they state, "We have now approximately 150 other operated cases in which we had previously reported a negative duodenum. When these cases came to operation for various other conditions, in not one of them was a duodenal ulcer found. In one autopsy, duodenal ulcer was found where the Röntgen examination was negative.

Cole and Brewer, of New York, using practically the same technique, reported 27 consecutive cases examined röntgenographically by Cole and operated upon by Brewer. In 21 of the cases a definite diagnosis was made by the Röntgen method alone, the clinical facts being withheld from the röntgenologist. Subsequent operation proved that 20 were correctly diagnosed, and 1 incorrectly. In 7 cases the *x*-ray diagnosis was negative regarding the presence of a gastric or duodenal lesion, although the clinical history was so strongly suggestive of ulcer or carcinoma that exploratory incision was justified. In not one of these cases was there found an organic lesion. In other words, in this series a correct diagnosis was made by serial röntgenography in 89 per cent. of the cases. One objection to serial röntgenography is that apparently there is no limit to the number of plates which may be made. In former years Cole stated that if one out of 30 plates showed normal conditions, the rest should be disregarded. The number has now grown to between 70 and 80 in one case. Other objections to the method are that it requires considerable time and is moderately expensive.

Another method for obtaining a duodenum filled with contrast material has been used by Holzknecht and others. It consists in first passing the duodenal tube then injecting bismuth through it, at the same time preventing escape of duodenal contents by gentle compression of its third part as it crosses the vertebral column.

Within the last two years, eight or nine men, independently of each other, came upon the idea of filling the duodenum with bismuth through the duodenal tube. Skinner, in Kansas City, was the first, so far as Lippman<sup>1</sup> knows, to carry it beyond the experimental stage. Lippman

<sup>1</sup> Surgery, Gynecology, and Obstetrics, December, 1914, p. 724.



tried this for about six months, but was unable to get uniformly good results because the bismuth flowed away through the duodeno-jejunal flexure or, if it had halted in the passage, rarely remained in sufficient quantity for any length of time, as the peristalsis soon carried it further. Finally, with Holzknrecht, he devised the very simple expedient of putting a compressor ("distinctor") at some point along the duodenum, usually at the duodeno-jejunal flexure which is located solely through its bismuth shadow and not by following any preconceived anatomical idea. Moderate pressure with the distinctor is sufficient. "Thus we dam back the bismuth and secure the complete filling of the lower part of the duodenum and a lesser filling of the rest of the organ." Lippman emphasizes that the duodenum as a whole moves up and down

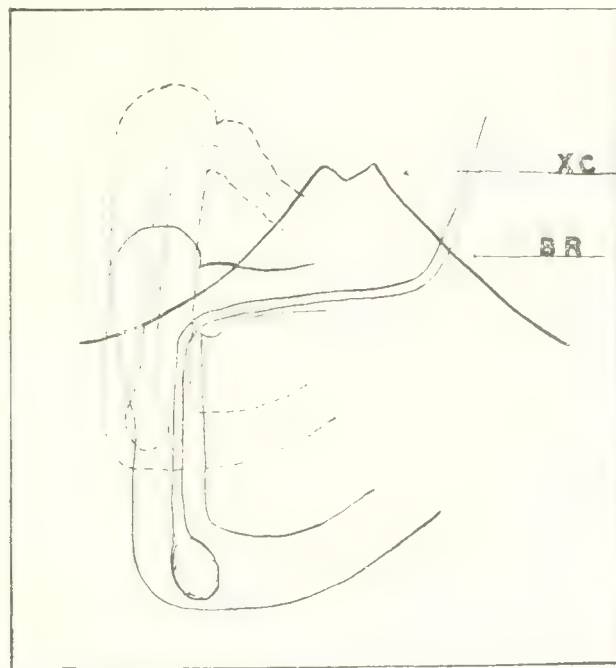


FIG. 38.—XC, xiphoid cartilage; BR, border of ribs. Duodenum (solid line) in inspiration, duodenum (dotted line) in expiration. (Lippman.)

with respiration and even more so with tensing of the abdominal muscles (Fig. 38). Figure 39 shows the duodenum taken in the erect posture during peristaltic rest. The physiological defect at the genu superior is due first, to the bend of the duodenum at this point, and, second, to sedimentation of the bismuth suspension by gravity. Figure 40 shows the duodenum in active peristalsis, with partial obliteration of the apparent defect. In the supine position, this apparent defect is also less marked. The starting point of the large-wave peristalsis is just below the bulbus. The wave runs down the pars superior and pars media until it reaches the obstructing distinctor. Peristalsis of the normal duodenum usually proceeds in regular waves, the time of a complete peristole varying in duration from five and a half to seven and a half seconds. There is no apparent difference in the peristaltic period whether

the olive (of the duodenal tube) is in the duodenum or not. In pathological cases the peristalsis is much more irregular, the duodenum contracting rhythmically for a few wave periods then frequently resting for minutes at a time, and then perhaps showing a single wave of peristalsis, to relapse again into a period of quiet. The introduction of a 0.5 per cent. solution of hydrochloric acid never excited the peristalsis, and, if peristalsis were present, it often stopped.

Some of the practical advantages of this method of examining the duodenum are as follows: Given a coiled duodenum, it was possible

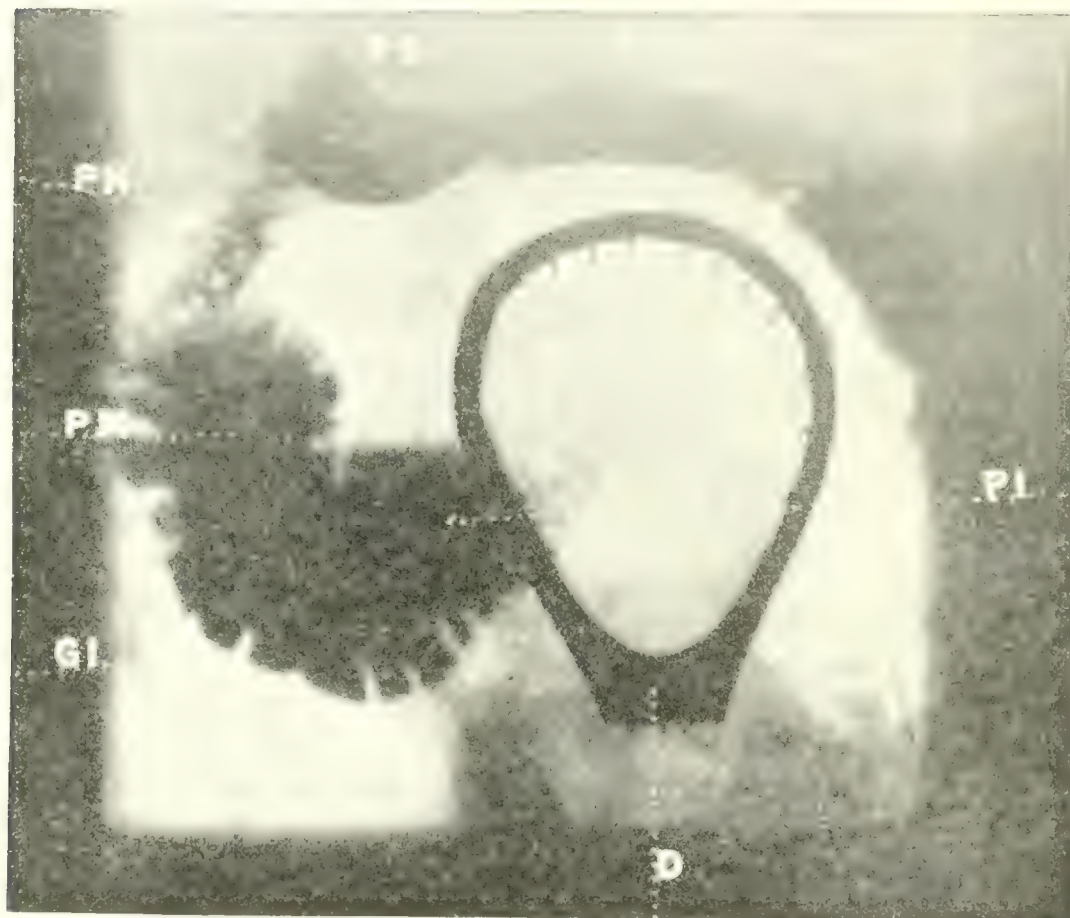


FIG. 30.—*PD*, pars superior duodeni; *P*, pylorus; *S*, stomach; *PI*, pars inferior duodeni compressed at duodeno-jejunal flexure; *D*, distinctior; *GI*, genu inferius; *PM*, pars media; *PN*, physiological narrowing at genu superior. (Lippman.)

to determine whether this was merely a variant or due to adhesions, by either pressing out the coil with the distinctior or by having the patient contract his belly muscles, thus moving the duodenum upward and straightening out the supposedly adherent coil. The advantages of this method of filling the duodenum, with compression at the duodeno-jejunal flexure, are: (1) more complete filling of the duodenum with the exception of the bulb; (2) observation of the peristalsis and mobility of the duodenum fluoroscopically; (3) more exact determination of the location of the tender point; (4) observation of niches—defects in the



duodenal picture; (5) diagnosis and differentiation of duodenal adhesions or variants; (6) dislocations due to extraneous causes, *e. g.* pancreatic tumor.

**Constrictions of the Duodenum.** In 1911, Rubin,<sup>1</sup> in discussing the anatomical variations of the great omentum, stated that its attachment to the stomach varied. In certain instances its edge hangs down from

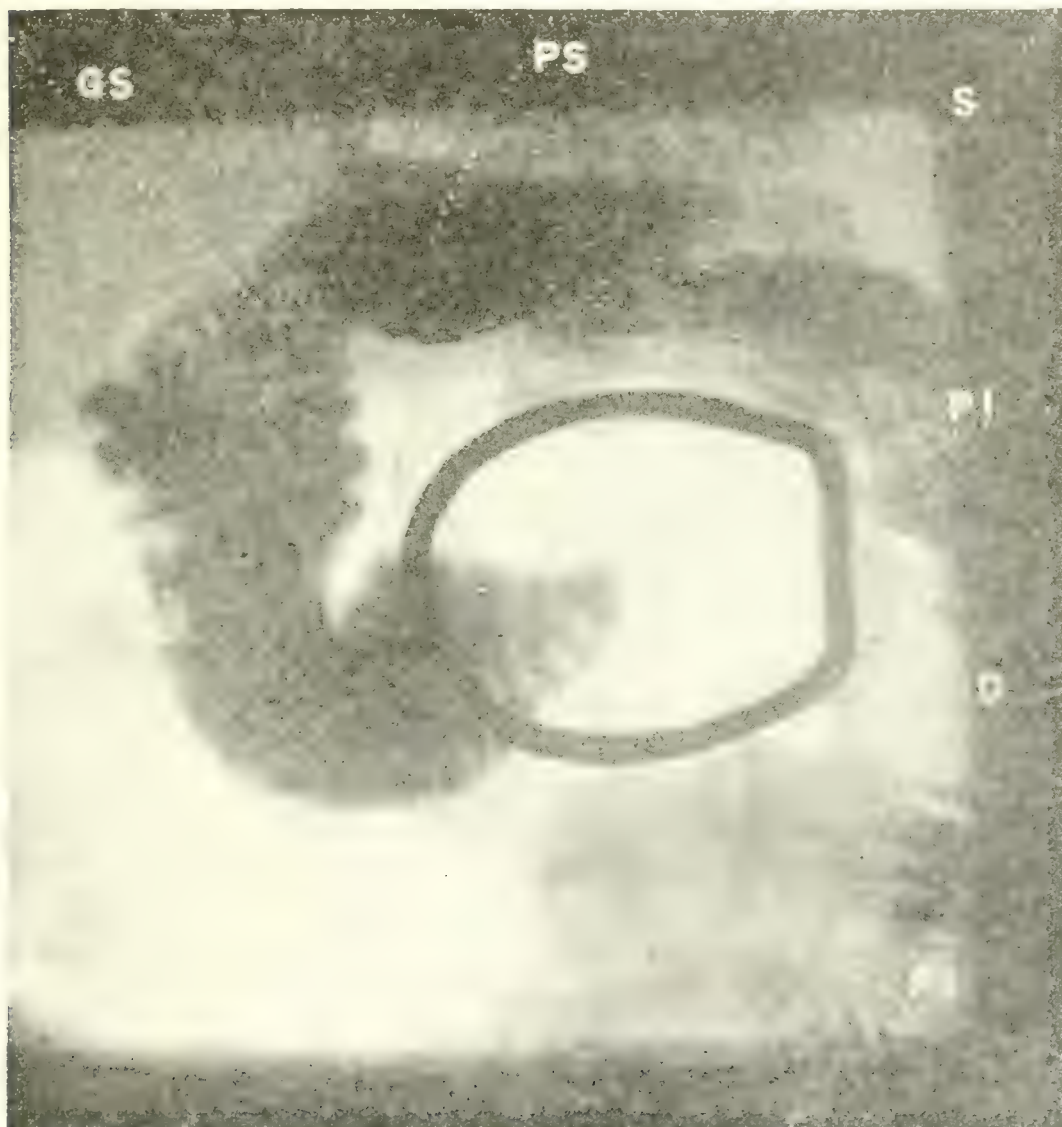


FIG. 40.—*S*, stomach; *PI*, pars inferior; *D*, distinator; *GI*, genu inferior; *PM*, pars media; *GS*, genu superior; *PS*, pars superior. (Lippman.)

the pylorus, and in others it is attached to the duodenum—consequently the extent to which it embraces the hepatic flexure varies. “At times, when the right edge has extended well over the pylorus, it may pass up to form a mesentery for the gall-bladder, which may extend from the cystic duct even to the anterior portion of the fundus.” Rubin<sup>2</sup> pointed

<sup>1</sup> Surgery, Gynecology, and Obstetrics, February, 1911, p. 117.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1911, p. 88.

out that such a normal structure may be mistaken at operation for an adhesion.

Recently, Harris<sup>1</sup> reports 6 cases of constriction of the duodenum by this very fold. All the patients gave a history of gastric distress after eating. "In each, a distinct band of peritoneum was found, extending from the left border of the second portion of the duodenum across the duodenum to the proximal end of the gall-bladder," or, as described in another case, "A distinct fold of peritoneum was found extending from the gall-bladder across the duodenum when it became lost in the upper layer of the transverse mesocolon. This fold constricted the duodenum at the second portion. When the gases of the stomach were forced into the duodenum, the first portion would become greatly distended, showing very clearly the constricting effect of the band or fold." In another case "the duodenum could be moved under the fold, showing that the fold was not really in the wall of the bowel or adherent to it." In yet another case "the duodenum was so indented on the lower and left side, that the opposed bulging surfaces had become adherent for from 2 to 3 cm." A similar adherence of the opposed peritoneal surfaces of the duodenum was noted in another case.

Harris quotes from the work of Ancel and Sencert<sup>2</sup> and Konjetzny.<sup>3</sup> The latter author says the practical importance and clinical significance of the ligamentum hepatocolicum lies in the fact that, under certain conditions, it may give rise to severe annoyance, simulating chronic cholecystitis which may occasion operative interference. Konjetzny says that he had seen such cases in which a perfectly normal gall-bladder was found, the only abnormal condition present being a broad peritoneal duplicature extending from the transverse colon to the gall-bladder which did not show inflammatory changes. Division of this brought relief. He believes the clinical symptoms caused by this fold are without doubt due to the drawing effect upon the transverse colon, especially when it is filled. He does not speak of any constricting effect upon the duodenum as observed by Harris.

There seems to be a direct analogy between this fold and the Jacksonian membrane and Lane's ileal kink in which the peritoneal folds so frequently observed rarely give rise to functional disturbance. However, when the latter occur and prove intractable to skilled medical treatment, unquestioned relief is afforded by division of the constricting bands.

Oppell<sup>4</sup> reports 4 cases of periduodenitis in which he divided the adhesions and covered the denuded areas with flaps of omentum. The patients made uneventful recoveries.

**Congenital Stenosis of the Duodenum, Associated with Situs Inversus Partialis.**<sup>5</sup> A nineteen-year old patient had suffered for a long time with

<sup>1</sup> Journal of American Medical Association, vol. lxii, p. 1211.

<sup>2</sup> Neue Deutsche Chirurgie, viii, p. 9.

<sup>3</sup> Ibid., p. 8.

<sup>4</sup> British Journal of Surgery, January, 1915, p. 408.

<sup>5</sup> Berliner. klin. Woch., 1914, No. 25. Zent. f. Chir., 1914, p. 1654.



severe abdominal pain for one to one and a half hours after meals, often accompanied by vomiting. Operation revealed a stenosis of the lower duodenum due to an extremely short mesocolon at this point. The duodeno-jejunal flexure lay to the right of the spinal column. The cecum lay in the left iliac fossa. An anterior gastro-enterostomy, combined with Braun's entero-anastomosis, afforded complete relief.

**Duodenal Stasis.**—Two cases are reported by Lexer.<sup>1</sup> In one the condition was associated with a movable kidney. In the second chronic pancreatitis. The stasis disappeared after nephropexy in the first case, and after an anastomosis in the second. Regarding the latter, Lexer raised the question whether the duodenal stasis was the result, or the cause, of the pancreatitis.

**Foreign Body of the Duodenum.** The following case is reported by Melchior:<sup>2</sup>

A nurse, aged twenty-four years, was admitted to Küttner's Clinic, in Breslau. She had swallowed a paper of needles five years before. Ever since then, more or less digestive trouble. For the past fourteen days continuous pain in the right side of the abdomen, with tenderness a finger's breadth to one side of the umbilicus. Antero-posterior *x*-rays showed four vertically situated needles in the descending part of the duodenum. Abdomen opened through a median incision but nothing could be felt. Relying entirely upon the *x*-ray findings, the duodenum was mobilized, now the upper ends of two needles could be felt in the descending part. Longitudinal incision of the duodenum permitted extraction of these. After closure of the intestine, two more needles could be felt close to the pylorus. By pressing upon the duodenal wall the points of these emerged through it and were pulled out. The small puncture wounds were closed over with sutures. Gastro-enterostomy was then established to prevent too much strain upon the duodenal sutures.

Review of the literature revealed that the point of transition between the vertical and third part of the duodenum was the site at which foreign bodies most frequently became lodged.

**Retroperitoneal Rupture of the Duodenum.** To the 101 cases in the literature Keller,<sup>3</sup> of Sauerbruch's Clinic, adds two.

In each case a powerful young man had been hit by a plank in the epigastric region. The site of rupture was directly where the duodenum crosses the spinal column in its third (horizontal) part. In the first case incision of the peritoneum and tamponade of the site of rupture was followed by death from retroperitoneal phlegmon and peritonitis. The second case, in which a suture was made, recovered.

A single case is reported by Maddock.<sup>4</sup> A wooden plank fell from

<sup>1</sup> Zent., 1914, p. 1031.

<sup>2</sup> Deutsch. Zeitschr. f. Chir., Band exxvii, p. 473.

Brun's Beiträge, Band xc, Heft 2.

<sup>4</sup> British Medical Journal, April 18, 1911.

the ceiling on the patient's right side while he was asleep. The corner of the plank hit the man over the eighth rib in the midaxillary line. He died after seven weeks. Postmortem showed the posterior surface of the descending portion of the duodenum had ruptured in the long axis of the bowel. The infection then spread around the chest wall, along the eighth rib, pointed, and then infected the liver, forming an abscess cavity. The lower portion of the right lobe of the liver was gangrenous. The peritoneal cavity contained serous fluid and large masses of clear, gelatinous matter.<sup>1</sup>

**Exposure of the Duodenum (in Its Third Portion).** In two cases of extraperitoneal rupture of the duodenum, the difficulties encountered, suggested to Kanavel<sup>2</sup> the necessity for free mobilization of the third or inferior horizontal portion. He has used the following method in other cases for exposing the head of the pancreas or the entrance of the common bile duct into the intestine. After turning up the transverse colon and omentum and elevating the back of the patient by means of a kidney elevator, the transverse duodenum, the hepatic flexure of the colon, and the root of the mesentery are exposed. An incision of the peritoneum between the reflected colon and duodenum freely exposes the third portion of the duodenum. By tearing the peritoneum, the entire retroperitoneal duodenum is freed and brought into the field from the entrance of the bile duct to the jejunal angle without hemorrhage or injury to any structure. That one can suture a considerable tear in the gut in this situation has been Kanavel's personal experience. He found it of especial value where one must decide whether there is a chronic pancreatitis, a carcinoma of the head of the pancreas, or a stone in the diverticulum of Vater. Here, instead of the laborious and inexact method of palpation from above, he says, "We can in less than a minute turn up the colon, nick the peritoneum, separate the edges with the index finger and raise the duodenum with the attached head of the pancreas from its bed. The entire head of the pancreas can now be held in the hand, and, in case of doubt, a section removed for microscopic examination. The duodenum can now be rolled up and the site of the entrance to the common bile duct examined from behind. In thin individuals the mobilization is so free that at least it would seem that a stone could be removed if it was thought advisable, although he has had no opportunity to test this statement. After the examination is completed, a single fine catgut suture closes the rent in the peritoneum."

<sup>1</sup> In contrast to the etiological factor of the duodenal ruptures just recounted, are 3 cases of traumatic rupture of the small intestine of Radcliffe's (*British Medical Journal*, April 18, 1914). All were in strong, well-developed men in the best of health, who sustained a sudden, unexpected, very violent pull upon the outstretched arms held over the head. There was no direct trauma to the abdomen nor were there any external signs of abdominal injury. Extreme collapse was not noticed.

<sup>2</sup> *Surgery, Gynecology, and Obstetrics*, April, 1914, p. 484.



The exposure of Kocher, through which the peritoneum covering the right kidney is incised vertically an inch outside of the second portion of the duodenum, does not properly expose the third portion. In very difficult cases it might be necessary to use both the exposure of Kanavel and that of Kocher.

### THE SMALL INTESTINE.

**Regional Variations in the Contractions of the Small Intestine** are reported by Alvarez.<sup>1</sup> The rate of contraction varies inversely to the distance of the selected segment from the pylorus. Smaller amplitude and more rapid rhythm of the duodenal segment are associated with a greater muscular tone than is present in the lower ileum.

**Spastic Ileus.** Two unusually interesting examples appeared in the literature during the past year.

Cauli<sup>2</sup> reports the case of a robust boy, aged seventeen years, with no previous pathologic history. After ten days without movement of the bowels, the patient developed severe abdominal pain, with incessant vomiting. After four days the symptoms subsided, but, upon getting up, they returned. Enemata and morphine brought no relief, and the pain became so intense that operative measures seemed indicated. Nothing pathologic was found at laparotomy except that the small intestine over a length of 20 cm. was contracted; likewise the descending colon and flexure, the latter not larger in diameter than one's little finger. There was no dilatation above the contracted segment of intestine. After operation, the vomiting ceased and bowel function returned in a few days. Subsequent attacks of vomiting and obstipation developed from time to time since the operation. It was remarkable that even when the vomiting and occlusion of the bowels kept up, nevertheless, the boy felt well and his pulse was good between the intervals of pain.

Bützner's<sup>3</sup> patient was an infant with typical symptoms of intussusception. There was a sudden onset, collapse, subnormal temperature, apathy alternating with crying spells, presence of a palpable mass, localized tenderness and bloody mucous stool. The symptoms continuing, the abdomen was opened and the distended small intestine was traced downward for about three feet where the remainder of the small intestine was found in a state of complete collapse. The stasis ended as abruptly as if a clamp had been applied. The rest of the abdomen was normal, the colon containing a considerable quantity of blood. Recovery followed. The child was eight months old, breast fed, well nourished and previously healthy. It is conceivable that this might

<sup>1</sup> American Journal of Physiology, 1914, p. 177.

<sup>2</sup> Rivista Ospedaliera, July 30, 1914.

<sup>3</sup> Journal of American Medical Association, lxiii, p. 1391.

have been a case in which an intussusception spontaneously subsided. Fromme<sup>1</sup> also reports an acute ileus from spasm.

**Double Intussusception** is somewhat of a rarity. In the first of Borchard's<sup>2</sup> two cases, an ileocecal intussusception was reduced, but another one, further up in the jejunum, was overlooked. The patient died. In the second case an ileo-cecal intussusception was successfully reduced at operation; ten days later, symptoms of obstruction again developed, necessitating reopening of the abdomen and an intussusception about the middle of the ileum was found and reduced. Recovery.

The surgical measures suggested by Cubbin<sup>3</sup> to prevent recurrence of ileocecal intussusception, while they may be of value in chronic recurrent adult cases, have no place in the usual acute infantile ones. In the latter, recurrence is practically never seen, consequently the indication for prolonging the operation in which speed and minimum manipulation are of such prime importance, does not obtain.

The procedure suggested by Cubbin is as follows: After reducing the ileocolic intussusception, the ileum is brought parallel to the ascending colon and sutured to it with three to five catgut sutures. The cecum is fixed in the iliac fossa, in some cases, with another suture. The fact that as the two bowels are parallel, they cannot again intussuscept will at once be evident. The long mesentery of these intestines allows them to assume a horizontal position in the belly.

**Subserous Hematoma of the Intestinal Walls Following Operation for Hernia** under local anesthesia.<sup>4</sup> The hematoma was the size of a man's fist and lay just above the sigmoid. It caused ileus. At operation it was evacuated; the serosa was sutured again and the patient made an uneventful recovery.

The case of Moore's<sup>5</sup> of *cicatricial stenosis of the intestine* causing symptoms of chronic intestinal obstruction four weeks after reduction of *strangulated hernia*, belongs in the same category. Another instance of the same sort was published by Weiss.<sup>6</sup>

After operation for a femoral hernia in which the gut was dark blue, the patient developed symptoms of chronic intestinal obstruction. At re-operation several weeks later, the small intestine was found adherent to the femoral ring; at this point it was greatly narrowed and so scarred that in the course of dissection it was opened. Resection, with side-to-side anastomosis, was followed by an uneventful recovery.

Similar examples of stenoses developing after intestinal incarceration are to be found on page 110 of PROGRESSIVE MEDICINE for June, 1913.

<sup>1</sup> Deutsch. med. Woch., May 14, 1914.

<sup>2</sup> Zentralbl. f. Chir., 1914, p. 1440.

<sup>3</sup> Surgery, Gynecology, and Obstetrics, February, 1915, p. 177.

<sup>4</sup> Vogel, Wiener klin. Woch., 1914, No. 25.

<sup>5</sup> British Journal of Surgery, January, 1914, vol. i, No. 3.

<sup>6</sup> Zent. f. Chir., 1914, p. 288.



**Gas Cysts of the Intestines** were spoken of last year (p. 132). Since then contributions have been made by von Hacker,<sup>1</sup> Demmer,<sup>2</sup> and Barjon and Dupasquier;<sup>3</sup> they, however, contain nothing new.

**Meckel's Diverticulum Lined with Gastric Mucosa** is an extremely rare condition. Tillmann,<sup>4</sup> of Leipzig, reports such a case found at autopsy on a child, aged four years. The diverticulum was completely lined with typical gastric mucosa and the musculature was much more strongly developed than is customary to find in the small intestine. Appended to Tillmann's report are various references to cases previously described. In addition to these are the cases of prolapse of gastric mucosa through the umbilicus.<sup>5</sup> Tillmann refers to a case observed by him in 1881 of a prolapse of gastric mucosa through the umbilicus in a boy, aged thirteen years, and he refers to similar observations by other authors. On account of this second observation of a Meckel's diverticulum lined with gastric mucous membrane, he believes that his former case and the similar ones he has cited, represented constricted Meckel's diverticula which had been lined with gastric mucosa. In other words, an everted, partially opened ductus omphalomesariacus.

**The Larding-Needle Method of Enterostomy.** This technique has been employed in selected cases by Hofmeister since 1905.<sup>6</sup> It differs from the customary Witzel enterostomy in that the tube, as it emerges from the intestine, passes through a separate stab wound in the abdominal wall instead of coming out through the main wound as is usually the case. Special care must be taken to assure a secure approximation between the loop of intestine and the parietal serosa.

Of 73 enterostomies at Hofmeister's Clinic, performed between 1905 and 1912, 50 were made according to this larding-needle method and 23 according to the usual method.

The method is indicated provided the patient's condition justifies expenditure of the extra time necessary. It is not indicated when the intestinal wall is badly damaged, as, for example, in advanced cases of intestinal obstruction.

## APPENDIX.

**Umbilical Colic in Children a Sign of Appendicitis.** Küttner<sup>7</sup> criticizes the article of Moro<sup>8</sup> containing a description of frequently recurring colics referred to the region of the umbilicus which come on in attacks which Moro has termed recurrent umbilical colic. Moro

<sup>1</sup> Zentralbl. f. Chir., 1914, p. 104.

<sup>2</sup> Archiv f. klin. Chir., Band civ, No. 2, also Zentralbl. f. Chir., 1913, p. 2002.

<sup>3</sup> Provincial Medicine, 1914, No. 5.

<sup>4</sup> Zent. f. Chir., 1914, p. 507.

<sup>5</sup> See review of Cullen's work on Umbilical Tumors, PROGRESSIVE MEDICINE, June, 1913, p. 75.

<sup>6</sup> Nägele, Bruns' Beiträge, Band lxxx, Heft 2.

<sup>7</sup> Berliner klin. Woch., 1914, No. 4.

<sup>8</sup> Münchener med. Woch., 1913, No. 51.

ascribes this condition to a hypersensitiveness of the children and denies any connection with disease of the appendix. Küttner opposes this view, and brings forward a series of cases in which appendectomy freed the children from their suffering. The changes in the appendix were not remarkable. Often only a short mesentery, or kinking or abnormal insertion of the appendix was found. From his observation, Küttner emphasizes that this picture of so-called umbilical colic, accompanied by a periodic vomiting and transient disturbances of urination, should be considered as extremely suggestive of appendicular trouble.

In reply to Küttner,<sup>1</sup> Moro maintains that his patients were cured by proper dietetic and hygienic measures, together with suggestive psychiatric treatment. The clinical picture described by him had nothing to do with the appendix. He cites a series of cases, observed over a long time, which were healed by this treatment and denies that, in the case of an eventual appendicitis, the previous symptoms had anything to do with the disease of the appendix. He states that the good results of laparotomy at Küttner's hands do not prove that these umbilical colics are not preponderantly of neurotic origin, inasmuch as such nervous conditions are frequently improved after an operation has been performed. He describes a case in which the umbilical colics recurred after appendectomy.

Friedjung, in the same number, calls attention to the fact that this condition was first described by him in 1904 in the *Zeitschrift für Heilkunde* (Heft 4). He criticizes Küttner's series of cases, saying that some of these were true umbilical colics, and others, cases of appendicitis.

Küttner rejoins that the matter will be cleared up not by theoretical discussion but by the introduction of new material in the shape of clinical observations. He brings 9 new case histories. In all of these there were typical recurrent attacks of umbilical colic which ended in gangrene of the appendix. Appendectomy brought cure.

**The Diagnostic Value of Symptoms Evoked by Manipulations in the Right Inguinal Region in Acute Appendicitis** are published by Ten Horn<sup>2</sup> and by Lanz,<sup>3</sup> of Amsterdam. Ten Horn found that among 15 patients with acute appendicitis, in 12 it was possible to evoke pain by pulling upon the right spermatic cord. In 1 case traction upon the left spermatic cord was also painful; here operation revealed a diffuse serofibrinous exudate. In only 2 cases did traction upon the right spermatic cord fail to evoke pain. In exerting traction, care must be taken not to squeeze the testis.

Lanz believes that in an acute appendicitis the right cremasteric reflex is very much weakened or entirely absent. He has also noted cases in which the right spermatic cord was thickened and sensitive. The cord must be examined as it emerges from the external abdominal

<sup>1</sup> Berliner klin. Woch., 1914, No. 4.

<sup>2</sup> Zent. f. Chir., 1914, p. 1537.

<sup>3</sup> Ibid., 1914, p. 1705.



ring. Furthermore, if one introduces a finger into the canal and feels its anterior wall, one finds it is more contracted than on the opposite side. That is the lower margins of the internal oblique and transversalis muscles prevent the further progress of the finger in the inguinal canal. Besides, on the right, there is tenderness; on the left, none; and if the patient is told to cough, pain is thereby evoked on the right side.

Lanz says that years ago he called attention to relaxation of the sphincter ani, with abscess in the pouch of Douglas.

**A Modification of the Right Rectus Incision** was brought out by Eddington<sup>1</sup> who divides the posterior sheath of the rectus transversely in the direction of the aponeurotic fibres, preserving the muscle itself to form a support to the scar.

**Cullen's Method of Exposing an Adherent Retrocecal Appendix**, by using multiple traction ligatures, is reported by Neill.<sup>2</sup> In this way the appendix is gradually developed from its base to its tip. There is nothing particularly new in the retrograde development of the hidden appendix. Some surgeons use loops, and others use ring clamps or hemostats to exert traction. The mechanics of the procedure are identical, regardless of the means by which traction is applied.

**Removal of the Appendix in all Cases of Well-localized Appendicitis Abscess.** Van Buren Knott<sup>3</sup> reports a series of 500 cases of appendicitis with abscess, with a mortality of 1.2 per cent. In the 6 fatal cases, not a single death occurred from peritonitis. These are about the results which one should expect in the hands of a competent surgeon. I believe, however, that Knott's statement that the greater number of operators simply drain an appendix and do not attempt to remove the diseased organ until a second operation, is an erroneous one. In most of the surgical clinics situated in large centres, the attempt is invariably made to remove the diseased organ at the time of the first operation, *i. e.*, at the time of opening the abscess. Naturally, the older the abscess, the more difficult will it be to identify the diseased appendix. The more experienced the surgeon, the fewer cases of abscess of five or six days standing in which it will be safer to desist from further search for the appendix rather than to keep the patient on the table an unduly long time.

The paper of Knott correctly emphasizes the principle that an appendix which has given rise to suppuration will continue to cause trouble until removed.

**Subclavicular Appendicitis** is an almost unbelievable condition; however, it is described by Duval<sup>4</sup> who read his report before the Societe Chirurgicale of Paris. His patient was a boy, aged twelve years, who

<sup>1</sup> British Medical Journal, December 12, 1914.

<sup>2</sup> Journal of American Medical Association, lxiv, p. 299.

<sup>3</sup> Ibid., vol. lxii, p. 1004.

<sup>4</sup> Bull. et Mém. de la Soc. de Chir. de Paris, 1913, p. 1512.

had suffered with intermittent pains in the left chest accompanied by fever and vomiting. Various diagnoses were made, such as interlobar pleurisy, ecchinococcus of the lung, sarcoma of the lung, etc. The x-rays showed that the cecum and colon ascendens and transversus were in the thoracic cavity. A transverse incision over the eighth rib, with resection of the entire rib on the left side to its angle behind, opened the pleura. The cecum and appendix were intimately adherent to the shrunk lung at the apex of the left pleural cavity. The appendix was enormously enlarged and was surrounded by cheesy exudate. Appendectomy, separation of adhesions, reposition of the intestines, with closure of the gap in the diaphragm. Collapse and death on the following morning.

**Postoperative Thrombosis from the Parametrial Veins Nine Days after Interval Appendectomy. Fatal Pulmonary Embolism.** This most interesting observation was made by Friedrich.<sup>1</sup> There were phleboliths in the parametrial veins; the embolism occurred at the time of menstruation.

**Constriction of the External Iliac Vein by Strands of Scar Tissue following Appendectomy.** A powerfully built man, aged thirty-five years, a postman, was operated on in July, 1913, for suppurative appendicitis, with drainage. Five months later he noticed that although he felt perfectly well, the right leg swelled shortly after he had gotten up in the morning and that as soon as he lay down the swelling very quickly disappeared. The conditions became worse, so that at the end of February, 1914, he could barely move his leg. He presented himself to Cr  d  .<sup>2</sup> Examination showed that, upon standing up, the right leg swelled, became cyanosed and much warmer than the left and the calf increased 3 cm. in circumference. The femoral vein was therefore exposed above and below the Poupart's ligament, and a dense mass of cicatricial tissue removed. A cord-like band of scar tissue constricted the vein. Four weeks after the operation the man had completely recovered and could resume his normal occupation.

**Foreign Body of the Appendix.** The usual observation of this sort is not worth recounting. The features of Peterkin's case<sup>3</sup> are so unique that there can be no question about their scientific interest.

The patient was a man, aged twenty-four years, who has suffered for the past fifteen years with attacks of pain in the right kidney region and frequency of urination, averaging twelve to twenty times in twenty-four hours. The symptoms varied in intensity from time to time. The general health was excellent. On examination, a catheterized specimen showed a bladder capacity of 4 ounces. An alkaline urine, no casts, much pus and many bacteria. Cystoscopic examination revealed a chronic cystitis and a calculus a quarter of an inch in circumference sticking out of the smooth wall of the bladder half an inch above and a

<sup>1</sup> Verhandl. Deut. Ges. f. Chir., 1914.

<sup>2</sup> Zent. f. Chir., 1914, p. 1518.

<sup>3</sup> Pan-American Medical and Surgical Journal, October, 1914.



quarter of an inch back of the right ureteral opening. The ureteral catheter met an impassable obstruction at 2.5 cm. from the bladder.

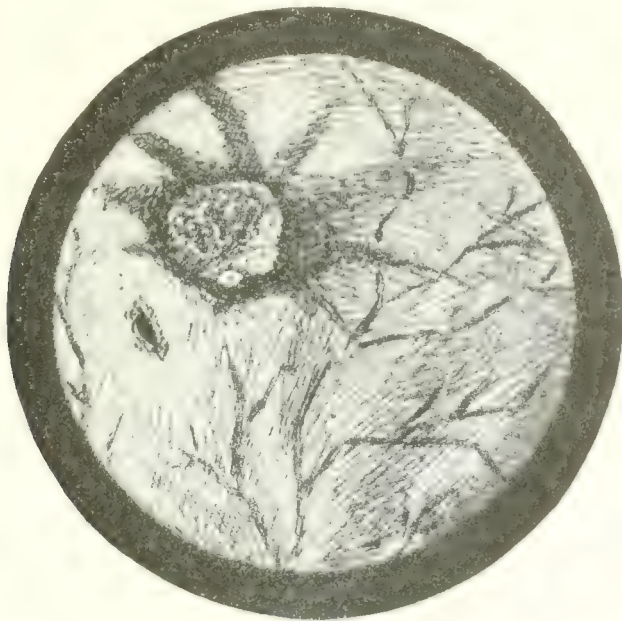


FIG. 41.—Cystoscopic view showing calculus just above and mesial to the right ureteral orifice; obstruction to ureteral catheter at 2.5 cm. (Peterkin.)



FIG. 42.—X-ray showing pin with its point in the bladder and its head in the appendix; in both cavities the pin was heavily incrustated, as it passed through their walls the incrustations were less. (Peterkin.)

The left ureter showed no obstruction and the specimen of urine obtained from it showed many colon bacilli (Fig. 41). The x-rays (Fig. 42) showed a pin one and a half inches long.

The operation consisted in extraperitoneal exposure of the right ureter through a right ilio-inguinal incision. It was found that the lesion was intraperitoneal and probably due to the appendix. Consequently, a second incision was made, this time through the right semilunar line. The inflamed appendix was attached to the bladder wall. It contained an enterolith with a portion of a pin at its centre. The point of the pin pierced the bladder wall so that 1.2 cm. lay in the bladder cavity. The remaining portion, 2.5 cm., remained external to the bladder in the appendix. The half inch in the bladder cavity formed a nucleus for a vesical calculus; the inch in the appendix, a nucleus for an enterolith. The appendix was removed, and the enterolith and pin were extracted by artery forceps. The fistulous opening in the bladder was so cartilaginous that it had to be enlarged by incision before the bladder could be entered and the distal end of the pin removed. (In extracting the pin it was broken by the artery forceps.) The bladder wound was now closed and a rubber drainage tube inserted through the lower part of the ilio-inguinal incision. The semilunar incision was sutured and a permanent catheter placed in the urethra. This caused so much tenesmus that it was removed at the end of thirty-six hours; the bladder wound promptly reopened. Seven days after operation a severe postoperative hemorrhage occurred. The drainage had eroded the internal iliac artery; it was ligated successfully. The patient recovered. Examination, eighteen months after operation, showed what looked like an ulceration at the point where formerly the pin had penetrated the bladder wall. The patient still had a cystitis but a cystoscopic examination proved that both the kidneys were healthy and that the infection was confined to the bladder.

**Traumatic Diverticulum of the Cecum following Appendectomy.** The first case in which Bunts<sup>1</sup> noted this condition was in a nurse who had been operated upon several years previously for a non-suppurating appendicitis. After about a year of comfort, she began to have renewed attacks of pain in the right side. The pain became so severe that finally the abdomen was opened. At the site of the previous appendiceal operation, a distinct white ring was found, indicating the location of a purse-string suture. The ring was nearly three-quarters of an inch in diameter. From this there protruded a pouch, like the finger of a glove, though somewhat conical and nearly one inch in length. By squeezing the cecum, it was possible to balloon this up with gas. Its wall was quite thin, apparently devoid of any mucosa and could easily be invaginated back in the cecum. Feeling that the distention of this diverticulum might be the cause of the colicky pain and that its extreme thinness might make it a positive source of danger from rupture, it was pushed back into the cecum and a double row of purse-string sutures applied

<sup>1</sup> *Surgery, Gynecology, and Obstetrics*, December, 1914, p. 791.



close to the opening. Subsequent to the operation the pain disappeared. Since that time Bunts has examined the cecum in all pelvic operations in which the appendix had previously been removed, and he found two more distinct cases although the condition was not as extreme as in the first.

**The Frequency of Carcinoma of the Appendix.** MacCarty and McGrath,<sup>1</sup> of the Mayo Clinic, report 44 cases in 8039 specimens making a frequency of 0.44 per cent. In all the specimens the lesion occurred at or near the tip, and in a portion the lumen of which had been obliterated. Of the first 22 specimens, in only 5 was the tumor large enough to be detected at operation. The remainder were discovered only upon making routine gross serial sections.

### LARGE INTESTINE.

**Colonic Stasis.** Distinct advances have been made during the past year, both in the pathology and treatment of this condition. The trend of thought has been more practical and less fanciful. Unilateral (end-to-side) ileosigmoidostomy is coming into well-merited disfavor (Oppell). The leaders in surgery, like Mayo and Moynihan, are beginning to perform well-planned partial colectomies which differ from those performed by Lane in that there are no raw surfaces left after completion of the operation. Anatomical studies have revealed that there were both good and bad pericolic membranes (Eisendrath and Schnoor). Lastly Röntgenographic observations controlled by operative findings have confirmed the fact that pericolic membranes exist without causing the slightest symptoms, while in certain patients with profound retardation to the passage of contents, no membranes or kinks are to be found. Here there seems to be proof that insufficiency of the ileocecal valve plays an important etiological role. (Case.)

**Anatomical Studies of Jackson's Veil.** Eisendrath and Schnoor<sup>2</sup> made observations during operation, from dissection of cadavers, and, finally, from examination of 10 fetuses. They found the parieto-colic fold of Jonnesco (synonymous with the pericolic membrane or Jackson veil) constantly present in fetal and post-fetal life. The upper border of this right-sided pericolic membrane was invariably at the level of the hepatic flexure and its lower border from one, to one and a half inches above the lower end of the cecum. In some cases the lower border either extended a little further down and covered the entire cecum and a part of the appendix, or fused with the fold of Treves. In the majority of cases this fusion did not occur. They believe that the genito-mesenteric fold of Reid is the forerunner of the ileopelvic band of Lane, and bears the same potential relation to the Lane kink as the pericolic mem-

<sup>1</sup> *Annals of Surgery*, May, 1914, p. 675.

<sup>2</sup> *Ibid.*, November, 1914, p. 622.

brane bears to possible kinks of the ascending colon. They say "We are not prepared to state at the present time what causes this change in pericolic membrane from an innocent persistent fetal structure to that of a distinct pathologic entity." One of the chief objects in their investigation was to call attention to the fact that there are two distinct types of pericolic membranes, (1) those which are innocent, and (2), those which may cause mechanical interference with the function of the colon. Each case must be judged by the operative finding. Not every pericolic membrane requires interference. From their examination of fetal cadavers they confirmed the findings of Grey and Anderson that there is a left parietal colic fold which corresponds in every detail with the same structure on the right side. It is a constant finding in the fetus, and "no doubt search for it in the future during operations on the left half of the abdomen will confirm these fetal observations."

**X-ray Studies in Chronic Intestinal Stasis.** Case<sup>1</sup> made *x*-ray examinations in 3000 cases subsequently coming to laparotomy at the Battle Creek Sanitarium. This enabled him to compare his Röntgen findings with the actual conditions found at operation. He states "it was interesting to note the frequency with which adhesions of the terminal ileum and colon were present in cases in which, from the bismuth meal examination, intestinal stasis had not been suspected and in which there was no reason to believe the existence of ileal stasis. Few of the patients were operated upon directly for the relief of intestinal stasis. Again, "In the experience of my colleagues and myself, it is with comparative rarity that radical surgery is necessary or profitable in dealing with intestinal stasis."

In another place he states, "In *every* case in which I have made an examination with the *x*-rays following the *short circuiting operation*, I have observed *retrograde peristalsis* in the colon. In many of these cases there was also a reflux of colonic contents through the anastomotic opening into the small intestine, and the resulting stasis of the small intestine converted the terminal ileum into a veritable colon; so that the patient, instead of having a colon five feet long, possessed a "colon" of indefinite length. In certain of these cases the terminal ileum had the caliber of the colon itself, so that when examined with the *x*-rays, it was not easy to differentiate ileum from colon. Again, Case examined many cases of ileal stasis which came to operation in which no adhesions were found around the terminal ileum. From this he concluded that while there are certain forms of obstruction from ileal kinks, there are numerous instances in which patients have come to operation for various other causes in which kinks have been found, where a carefully conducted *x*-ray examination had shown the absence of ileal stasis and where there

<sup>1</sup> Surgery, Gynecology, and Obstetrics, November, 1914, p. 592.



were no other clinical evidences upon which to base the belief that ileal stasis existed. On the other hand, there were cases with ileal stasis in which there were no adhesions. A study of these cases led to the conclusion that a large proportion of *ileal stasis is due*, not to kinking or adhesions of the terminal ileum, but to *incompetency of the ileocecal valve* or to spasm of the ileocecal sphincteric mechanism, or to a combination of these two factors.

In 50 or more individuals, Case tested the competency of the valve repeatedly to determine whether or not the competency observed was transient or permanent. At intervals of as long as three months, without exception, when the ileocolic valve has been found incompetent on one occasion, it was found incompetent at all subsequent observations. Ileocecal valve incompetency was found not only after bismuth enemas but after ingestion of bismuth meals. In numerous cases it was noted that the small intestine was empty at the twelfth hour, all the bismuth contents being in the colon. Yet, the next morning, bismuth was shown again in the terminal ileum, no new bismuth meal having been taken in the meanwhile. This observation was made repeatedly. At operation on such individuals, the surgeon noted gaseous or fluid distention of the terminal ileum which was often present in spite of thorough efforts at pre-operative bowel cleansing. The test, at operation, is carried out as follows: The ileum being clamped off by the fingers of an assistant some ten or twelve inches from the ileocecal valve, its contents are milked down through the ileocecal valve into the cecum. The normal ileocecal valve prevents any regurgitation of the cecal gas or fluid back into the ileum, even under considerable pressure, but the incompetent valve allows gas and fluid to pass with readiness varying with the degree of incompetency. In the majority of cases the operative findings agreed with those made at  $x$ -rays, but occasionally, at operation, valves proved incompetent which had given a normal test under the  $x$ -rays. Case reports that Kellog's operation for relief of ileocecal valve incompetency has been performed up to January 15, 1914, in 100 cases. The postoperative  $x$ -ray studies showed that in every instance after such repair of the valve, the emptying time of the terminal ileum had been markedly diminished and, in the majority of the cases, it had been reduced to seven or eight hours.

Payr<sup>1</sup> refers to the severe disturbance of the alimentary tract functions due to insufficiency of the ileocecal valve, with consequent stasis of the lower small intestine.

Lohfeldt<sup>2</sup> remarks upon certain cases of chronic perityphlitis with attacks of pain similar to those observed in cases of insufficiency of the valve, in which, however, the valve was not insufficient at the  $x$ -ray examination.

<sup>1</sup> Zent. f. Chir., 1914, p. 101.

<sup>2</sup> Fortschr. a. d. Ged. d. Röntgenstr., Band xvii, Heft 2

In Eastman's<sup>1</sup> cases, serial röntgenograms were made about two weeks after operation for stasis (cecosigmoidostomy) in which complete relief had been afforded. It was found that the bismuth column did not

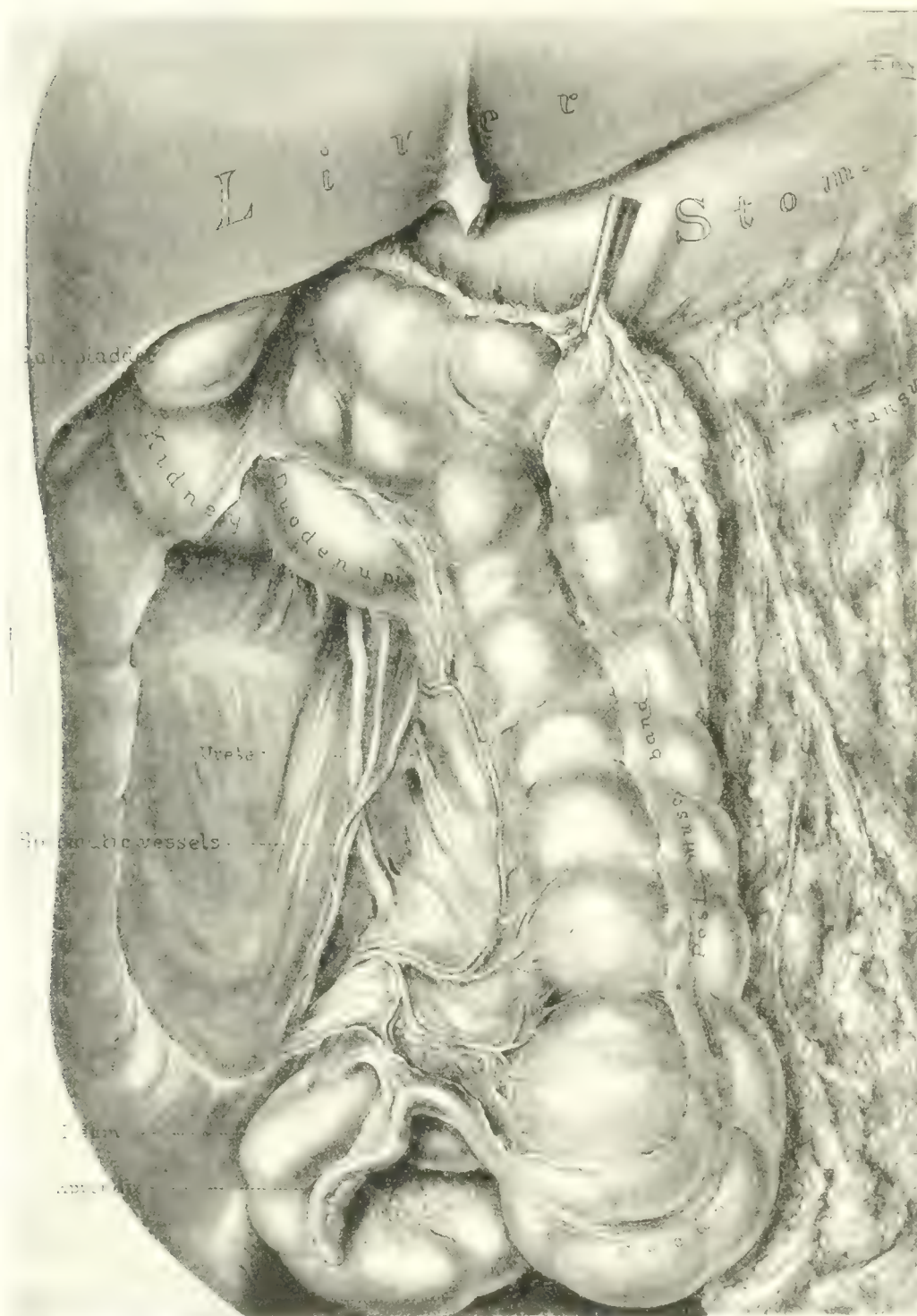


FIG. 43.—Division of the peritoneum which binds cecum and ascending colon to the abdominal wall. Retroduodenum spermatic vessels and ureter exposed. (Mayo.)

pass from the cecum through the anastomosis opening. The first picture, made twelve hours after the bismuth meal was taken, showed

<sup>1</sup> Journal of American Medical Association, lxiii, p. 441.



the cecum filled with bismuth, and subsequent examination showed the bismuth column rising to the hepatic flexure. Later (twenty-four hours), bismuth was found in the transverse and ascending colon. Three weeks

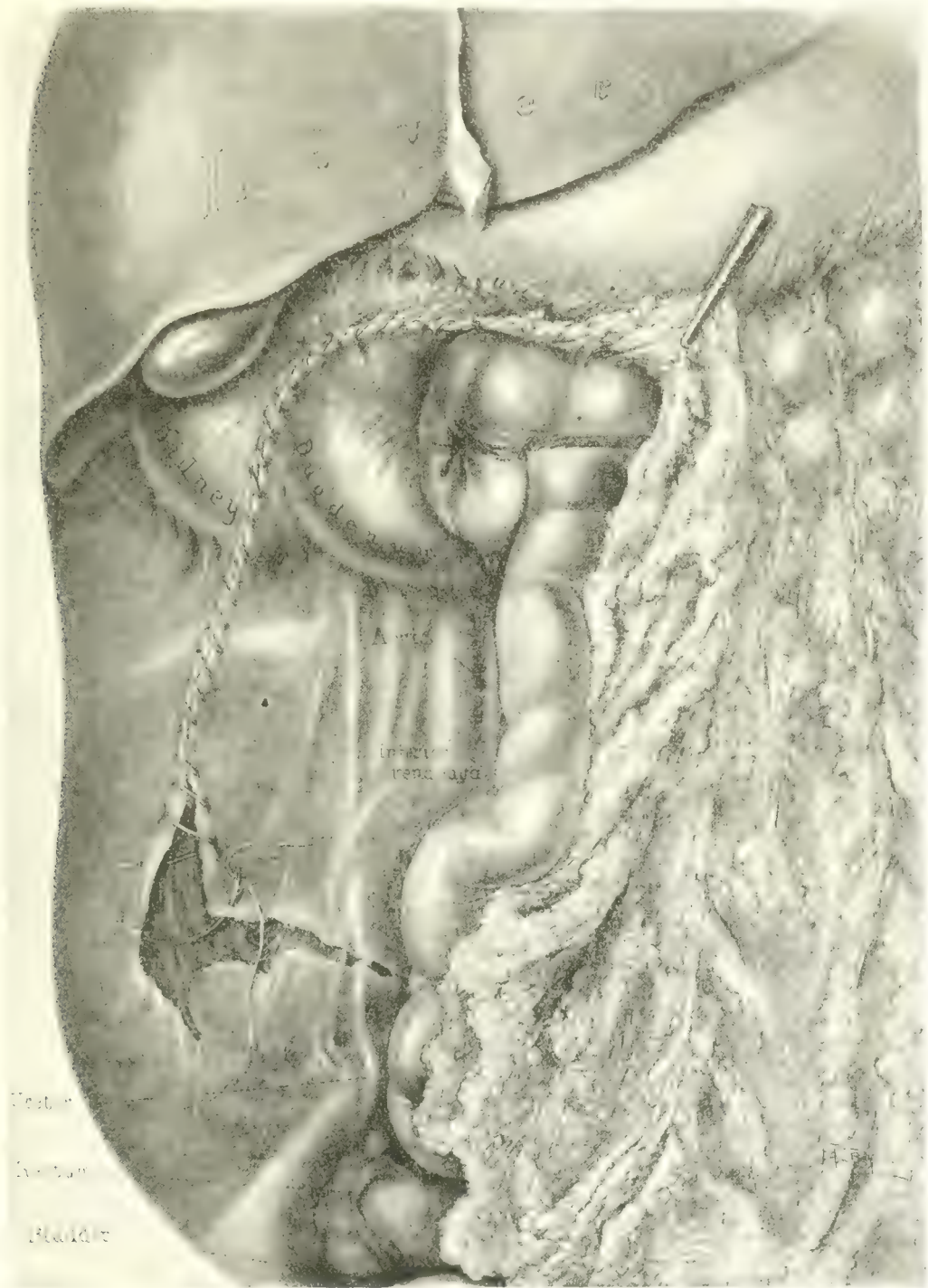


FIG. 44.—Result after removal of ten inches of ileum, appendix, cecum, ascending colon, hepatic flexure and one-fourth of transverse colon. End-to-side ileocolostomy. Running suture closing peritoneum of posterior wall. (Mayo.)

after operation, röntgenograms showed that the bismuth column, after reaching the cecum, passed partly through the anastomotic opening, although the greater part arose in the ascending colon as before. In



cases with extensive adhesion formation, the proportion of colon contents passing through the stoma was greater. Eastman says the Röntgen examination of such cases shows how little we know of the hydrostatics of the colon. It seems clear that gravity plays little or no part in the course taken by the colon contents, intra-abdominal pressure having a much more important role.

PARTIAL COLECTOMY FOR INTESTINAL STASIS. W. J. Mayo<sup>1</sup> reports 20 cases in which exaggerated conditions of cecocolic stasis with constipation amounting to obstipation, in which ten inches of the terminal ileum, appendix, cecum, ascending colon, hepatic flexure and a portion of the transverse colon were removed. As little as possible of the transverse colon covered by the omentum was removed. As much of the omentum as possible was preserved in order to prevent intestinal adhesions. In all the cases there were bands, kinks, and adhesions of advanced grade. After resection, an end-to-side anastomosis of the ileum into the transverse colon was made; there was marked improvement in general condition and, in 87 per cent., relief from constipation. In nearly all these patients, the appendix had previously been removed, and in a number of them other operations, such as elevation and fixation of the cecum, combined with narrowing of its lumen, etc., had been done without relief. To test the question of the effect of eliminating the ileocecal mechanism and removing the proximal colon in constipation, Mayo grouped together all cases in which the head of the colon was removed without regard to the pathologic condition which led to the operation, and investigated what effect the operation had on the evacuation of the large intestine. It was found that nearly all patients who had been constipated before operation had been much relieved post-operatively. Yet in but one case had diarrhea been manifested. Speaking of this resection, Mayo says, "Although the operation is a serious one, we have lost no patients operated on for this condition. The number of persons whose condition, in our opinion, would warrant the risk however, is comparatively small, and I *cannot but deplore the widespread adoption by the medical profession of surgical measures for this and allied conditions while they are in the experimental stage with little evidence to show that the supposed cures are permanent.* When one looks back over the fads and fancies in medicine, especially as applied to the so-called neurasthetic group of patients, one may well pause and make haste slowly."

In speaking of this class of cases, Mayo said, "If we could only say to certain patients that they have too much bowel and that if they continue to live on a meat diet they will not live as long as on a vegetable diet because nature has created them vegetable feeders, we might do good, if we were sure it were true." Of all the men partaking in the dis-

<sup>1</sup> Journal of American Medical Association, lxiii, p. 446.

cussion of this subject, Mayo was the only one who made any reference to the dietetic management of such cases. The others merely stated that drastic purgatives did not relieve the patient except for the time being.

Moynihan<sup>1</sup> discusses the various assertions made by the Lane school in a most reasonable and unprejudiced way. He points out that the wall of the gut in cases of stasis is thin and almost translucent, not, as in cases of veritable obstruction, thick from hypertrophy. He expresses the idea that it is feebleness of action, rather than impediment, which causes the tedious transit of contents. Of ileosigmoidostomy he says, "In every case, with one exception, in my own series there has been some regurgitation of the intestinal contents upwards along the descending colon to the cecum. The stasis then is worse than before, for a mass of fecal material, that is never wholly dislodged, is palpable at all times. The symptoms which are nevertheless relieved at first by these measures, are clearly not due to merely stagnation of the bowel contents. No method of anastomosis or any fashioning of a new kink can wholly prevent this backward flow. Personally, I believe nothing short of colectomy offers a substantial chance of cure. The part of the gut that needs removal is the last part of the ileum, the cecum, and the ascending colon." Moynihan holds that it is an advantage to have the descending colon and pelvic colon left behind. If the descending colon and sigmoid are too lengthy, he adopts a suggestion of Mr. Grey. He loosens the remaining colon so that the pelvic colon now becomes the descending colon and the latter is made to occupy the place of the transverse colon. This operation, Moynihan states, is simple, very satisfactory in its results, and he has had no mortality from it. Like Mayo, he points out the advantage of leaving some of the omentum. Friedrich's operation, for removal of the last of the ileum and the ascending and beginning of the transverse colon, allows of very adequate peritonization of all the rough places left and the closure of the gaps between the divided ends of the mesentery. Moynihan concedes the remarkable subjective relief experienced by a patient after this operation. As regards the difference between the relation of gastric and duodenal ulcer and the various phases of cholelithiasis with intestinal stasis, he says, "For the last few years when operating for a chronic gastric or duodenal ulcer, or for gallstones, I have made, in all proper cases, a careful search of the site of the various obstructing membranes we now so easily recognize, and I am compelled to assert that the evidence of stasis, or of the demonstrable condition upon which it so often depends, is not to be found in more than a very small proportion of the cases. Moreover, the recovery of the patient, who, for example, has had a gastro-enterostomy done for a duodenal ulcer, is so speedy, so complete, and so enduring

<sup>1</sup> *Surgery, Gynecology, and Obstetrics*, February, 1915, p. 151.

that it is a sheer impossibility that any lingering disease remains behind. *We must put this matter definitely, for recently I have heard of patients with declared duodenal ulcer who have lost their lives through operations directed to the relief, not of the ulcer but of a wholly supposititious intestinal stasis.*

*For gastric ulcer, duodenal ulcer and cholelithiasis, no operation should be sanctioned which does not deal directly with the disease of the parts involved. To perform colectomy or ileosigmoidostomy in such cases is, I think, to exceed our right and to neglect our plain duty."*

Of various diseases of the joints, such as rheumatoid arthritis or tuberculosis, he says, "Without question there is some improvement in some cases, much improvement or even cure in a few, but the bulk of the cases, so far as I can judge, are not appreciably affected by operation upon the intestine. As to the curative effect of operations for intestinal stasis upon conditions, such as exophthalmic goitre, trigeminal neuralgia, various forms of functional and organic disease of the heart, diseases of the breast, of the thyroid gland, of the pelvic organs of the female, and, finally, cancer, he says, "The claims are many, the proofs few."

All the evidence which we have set before us requires the most careful sort of sifting. Mixed up with the most exaggerated pretensions, are incontrovertable facts or, as Moynihan puts it, "among much that is dross there lies a nugget of pure gold."

Oppel,<sup>1</sup> of Petrograd, takes a similar stand to that of Mayo and Moynihan. When the cecum is rather large and there is marked perityphlitis, he resects the cecum and ascending colon. In less severe cases, he treats angulation at the splenic or hepatic flexures either by side-to-side anastomosis of the adjacent limbs or by division of the phrenocolic or hepatocolic ligament. Payr<sup>2</sup> recommends relief of kinking at the splenic flexure by division of the phrenocolic ligament with consequent dropping of the kinked gut and subsequent peritonealization of the serous defect. Associated with unusually redundant transverse colons, he has noted extraordinary shortness of the sigmoid. He believes that anatomically abnormal positions of the large intestine predispose to the establishment, and support the continuance, of all sorts of colitis. He is absolutely convinced that catarrhal appendicitis and typhlitis, in many instances, are only a part of the symptoms of a general colitis. In this way he accounts for persistence of pain in the right iliac fossa after appendectomy.

**Regarding Cecum Mobile,** he says, "I believe that in the majority of these cases it is not the mobility that is at fault but the dilatation of the cecum and possibly an anomaly of the latter."

Practically the same idea is voiced by Lardennois,<sup>3</sup> who says, "The fact that the cecum is prolapsed, distended, and too movable, does not

<sup>1</sup> British Journal of Surgery, January, 1915, p. 408.

<sup>2</sup> Zentralbl. f. Chir., 1914, p. 101.

<sup>3</sup> Jour. de Chir., 1914, xii, p. 701.



necessarily indicate that it should be sacrificed. Instead of being the cause of the trouble, as is so often assumed, it is more apt to be the victim of colitis of the adjacent segments, dilated because of their defective function and degenerated from progressive distention. In other words, the distended cecum is the result of relative obstruction, either at the hepatic flexure or at some point in the colon beyond."

The anatomical researches of Ssapeschko<sup>1</sup> coincide with those of Dreyer.<sup>2</sup> He found cecum mobile present in more than 60 per cent. of all individuals, and believes that fixation, as advocated by certain surgeons, will lead to constipation on account of hindrance to peristalsis.

As the writer has pointed out in previous reviews, the reefing of a dilated cecum is analogous to the reefing of dilated stomachs practiced in the early days of gastric surgery and now obsolete.

During the past three years whenever Oppel<sup>3</sup> could, he systematically combined resection of the appendix with an obliteration of the cecum by invaginating the latter so far that its lower border became level with the lower margin of the entering ileum (Fig. 35). He, however, concedes that the results were not uniformly successful.

**Exclusion of the Large Intestine.** In a poorly arranged, but most instructive paper, Oppel,<sup>4</sup> who is Professor of Surgery at the Imperial Medical Academy of Petrograd, reports a series of 41 cases.

COMPLETE UNILATERAL EXCLUSION of the large intestine (end-to-side, with formation of one or more cul-de-sacs). The details of a number of the cases are of sufficient interest to justify their repetition.

A tuberculous fecal fistula of the cecum was operated upon twice. First, an ileocolostomy (with the transverse colon), with division of the ileum, was made. Later on, an ileosigmoidostomy, also with division of the ileum. In spite of both these operations, the feces continued to pass out through the fistula in the caput coli (Fig. 45).

In another case, Oppel resected the cecum and ascending colon for carcinoma and joined the ileum to the transverse colon. Fistulae of the stumps of both transverse colon and ileum developed, which refused to heal in spite of three attempts to close them by means of suture. Ileosigmoidostomy was then performed, with division of the proximal portion of the ileum; two or three days after operation, feces again escaped through the fistula of the transverse colon. Accordingly the transverse colon was divided at the splenic flexure, thus converting the fecal fistula into a mucous one (Fig. 46). The patient was seen a year and a half later and had no complaints; his mucous fistula did not cause him much inconvenience.

The cases cited above show that so-called complete unilateral exclusion is a misnomer because it does not really exclude anything.

<sup>1</sup> Zentralbl. f. Chir., 1914, p. 1323.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1912, p. 101.

<sup>3</sup> Annals of Surgery, October, 1914, p. 432.

<sup>4</sup> Ibid., p. 409.

Oppel concedes that the presence of a fistula in the large intestine might predispose to a reverse current of the intestinal contents because

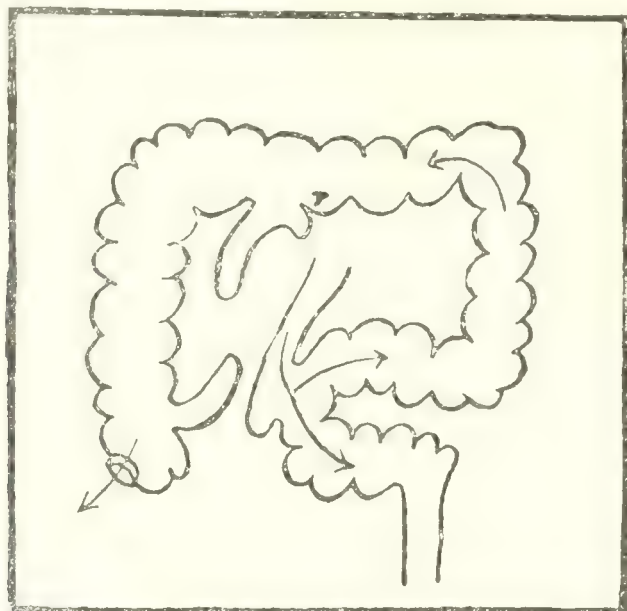


FIG. 45.—A case of tuberculous fistula of the cecum in which transversostomy and ileocolostomy, with division of the ileum, both failed to prevent the feces from issuing from the fistula in the caput coli. (Oppel.)

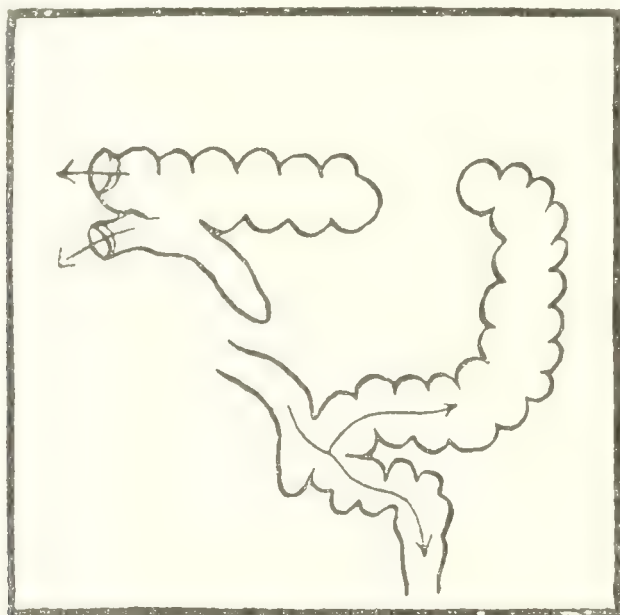


FIG. 46.—Extirpation of cecum and ascending colon for carcinoma. Fistulæ of transverse colon and ileum developed which proved intractable to attempts at closure. Ileosigmoidostomy (with division and implantation of ileum) also failed. Finally division of transverse colon at splenic flexure converted the fecal into a mucous fistula. Patient comfortable for one and a half years. (Oppel.) (But this is too short a time to determine whether the blind end will not eventually become the seat of further trouble.—REVIEWER.)

such a fistula might constitute a point of least resistance toward which the feces might be propelled even by normal peristaltic waves. In

other words, one could reason that if there were no fistula there would be no such movement, and hence that the so-called unilateral exclusion might be applicable to cases in which there was no fistula. Experience, however, has shown this *not* to be the case. Whether the anastomosis be between the ileum and transverse colon or between the ileum and the sigmoid, the part of the colon thus excluded forms a cul-de-sac which may become filled with fecal material and cause serious trouble. The case of Grekoff is quoted in which an accumulation of feces in the cecum, after exclusion, led to a perforation and caused the death of the patient. The experience of von Beck is related, in which, out of 32 cases of ileosigmoidostomy, 6 developed intestinal stasis in the excluded cul-de-sac.

Of the case diagrammatically represented in Fig. 46, Oppel states: "However favorable this result might have been . . . it is unfortunately not the rule, but an exception. Lane, who now removes the large intestine in cases of habitual constipation, in the beginning used to divide the transverse colon at the splenic flexure after ileorectostomy. Sometime after the patients complained of symptoms which had to be ascribed to a distention by gas of the sigmoid and of the descending colon, that is, of the cul-de-sac." For this reason, Oppel says that Lane began to resect the whole of the large intestine.

Oppel quotes a case of his own in which he had operated a number of times upon a female patient for a severe colitis, the end result being ileosigmoidostomy and a cul-de-sac which led upward toward the splenic flexure. The pain in this sac was so intractable that he was obliged to establish a fistula at the base of the upper portion of the sigmoid.

In yet another case, a female, aged twenty years, Oppel removed the whole of the sigmoid, the descending colon and the left two-thirds of the transverse colon for multiple tuberculous strictures of the large intestine. As it was impossible to bring the ends of the transverse colon and the descending colon together, he closed both ends, and, after removing the appendix, united the cecum with the pelvic colon by lateral implantation (Fig. 47).

Sometime later, signs of stasis appeared in the cul-de-sac formed by the ascending colon, with distention and peristaltic movement. These caused Oppel to establish a fistula of the ascending colon.

A case of von Haberer was also cited; here the stomach and transverse colon were resected for carcinoma, and a lateral anastomosis was made between the cecum and the sigmoid. The patient died of perforation of the ascending colon.

Oppel quotes a similar case of his own in which he had to resect a portion of the stomach, a part of the sigmoid and part of the transverse colon for a widespread gastric carcinoma. Here, "in spite of the perfect healing of all the suture lines, the patient died of exhaustion within a



fortnight, an abscess having also formed in the vicinity of the descending colon."

*Cul-de-sacs favor fecal stasis and predispose to perforation of the blind end. Should the formation of cul-de-sacs be inevitable, such exclusion should be combined with establishment of a fistula at the top of the cul-de-sac.*

PARTIAL UNILATERAL EXCLUSION (SIDE-TO-SIDE ANASTOMOSIS). I believe Oppel goes a little too far when he adversely criticises the Giordano-Bergmann operation of side-to-side cecosigmoidostomy. He says that cecosigmoidostomy closes the ring of the colon and, to a certain extent, owing to the fixed position of the sigmoid, it interferes with the discharge of feces *per vias naturales*. He bases his criticism on the fact that one patient with "colitis dolorosa" was not relieved either by a cecosigmoidostomy performed by Koerte nor by the subsequent

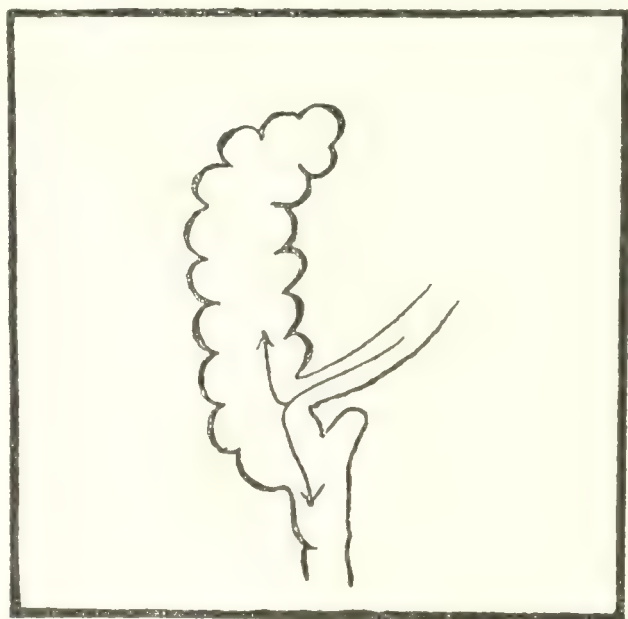


FIG. 47.—After removal of the transverse colon, the descending colon, and sigmoid, and closure of the cut ends, the cecum was united to the pelvic colon (after removal of the appendix) by lateral implantation as shown in the diagram. (Oppel.)

series of operation performed by Oppel himself. Nor is Oppel entirely consistent, for he adversely criticises a large intestinal entero-anastomosis (cecosigmoidostomy) and immediately afterwards praises entero-anastomosis between the ascending and transverse colons or transverse and descending colons, qualifying his statement, however, by saying that the more economically it is done, the more satisfactory are the results.

At any rate colocolostomy for relative obstruction at the hepatic and splenic flexures has proven itself a most useful and effective procedure. Its success is ascribed by Oppel largely to the fact that no cul-de-sacs are left behind. Likewise, colocolostomy lower down, namely sigmoidorectostomy performed in the megacolon of the sigmoid, has been used with relative success by Oppel (5 recoveries out of 7 cases).

Transversosigmoidostomy was performed six times for various conditions. One case died from intestinal obstruction of the small intestine which had become kinked around the short mesosigmoid. Of the remaining five who bore the operation well, one remained perfectly well for five years. In another, the large intestine, beginning with the splenic flexure and ending with the anastomosis of the sigmoid, was resected on account of a colitis. Within a few months after this, a secondary operation had to be performed because of contraction at the site of anastomosis. Of the three remaining patients, Oppel states that they felt considerable improvement after the operation.

In a final case of entero-anastomosis, a patient suffering from obstruction and pain in the region of the ascending colon was found to have the right half of the transverse colon hanging down as far as the pelvis.

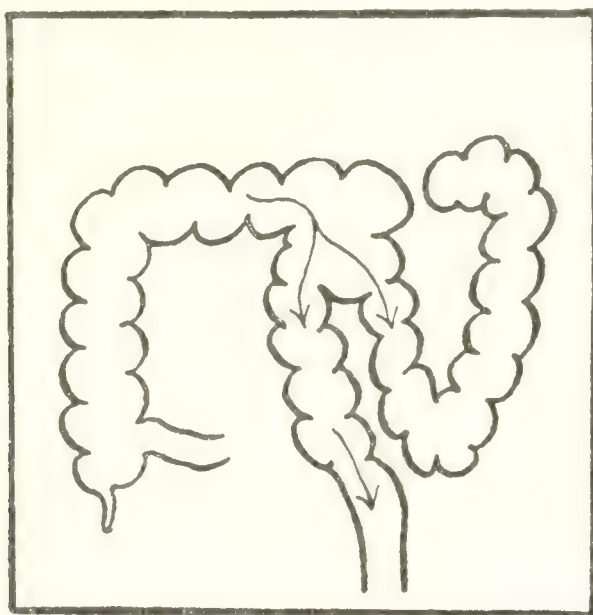


FIG. 48.—Transversosigmoidostomy with division of the transverse colon beyond the anastomosis. The descending colon resected within a year was neither dilated nor over filled. (Oppel.)

A side-to-side ileotransversostomy was performed, affording complete relief (Fig. 49).

From the foregoing it is clear that partial (side-to-side) unilateral exclusion constitutes a satisfactory means of emptying the proximal portion of the gut in cases of relative obstruction. Should, however, such an obstruction become absolute, a double cul-de-sac formation, with its attendant evils, promptly results. Thus, in the Giordano-Bergmann operation an obstruction at the centre of the transverse colon would result in the production of two cul-de-sacs.

Complete unilateral (end-to-side) exclusion, as shown above, is a much less satisfactory procedure.

*Complete bilateral exclusion* is indicated either as a preliminary step toward ultimate resection or as a final measure where resection is either impossible or inadvisable.

Oppel cites the well-known maxim that *every bilateral exclusion must be provided with a fistulous opening to act as a vent*. This dictum of

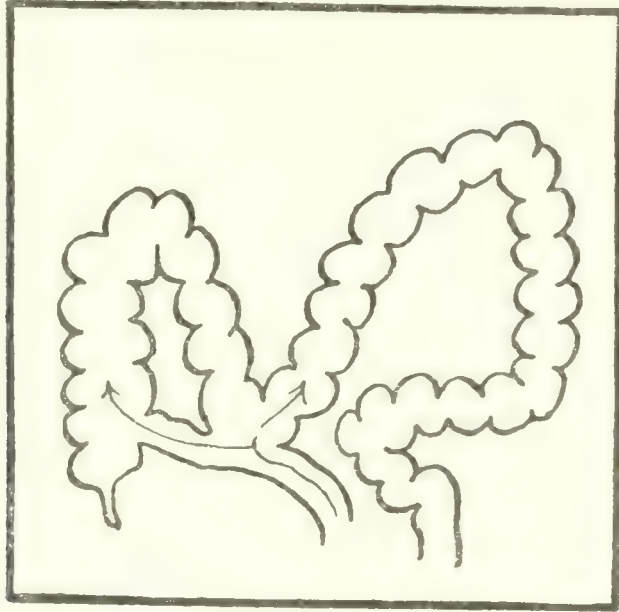


FIG. 49.—There was obstruction and pain along the ascending colon, the right half of the transverse colon hung down as low as the pelvis; side-to-side ileotransversostomy gave complete relief. (Oppel.)

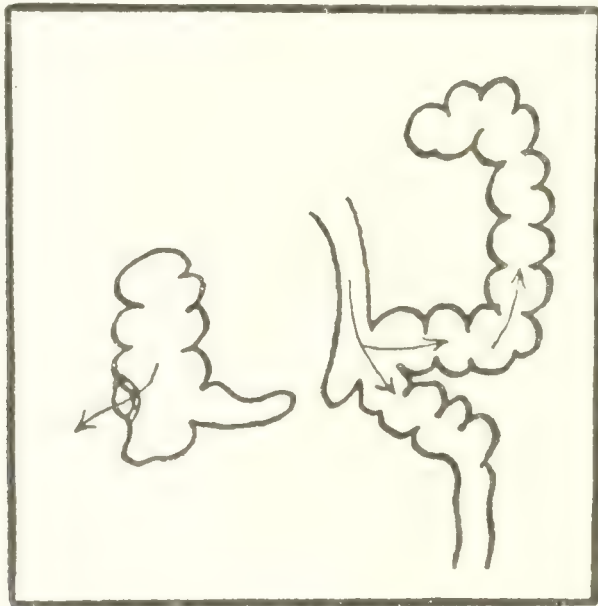


FIG. 50.—For severe mucous colitis the transverse and upper portion of the ascending colon were resected; an anastomosis between the cecum and sigmoid was abolished. On the right side the cecum and remainder of the ascending colon were bilaterally excluded, being supplied with a fistula which had been there for some time. After operation, the region of the summit of the descending colon became so painful that a fistula had to be made to bring relief. (Oppel.)

Oppel's is borne out by the experience of Finsterer,<sup>1</sup> of Hochenegg's clinic in Vienna. In 14 cases in which excluded portions of the intestine

<sup>1</sup> Verhandl. d. Deutsch. Ges. f. Chir., 1914.



were drained by fistulae, the fistulae closed. Five died of perforation of the totally closed intestinal segment, one as late as thirteen years after operation. Hoehenegg believes that it is better to make complete exclusion rather than unilateral exclusion, on account of the danger of subsequent perforation. In total exclusion, both ends of the excluded gut should be left open as fistulae. Total exclusion is recommended in severe colitis as well as in the two-stage resection of malignant tumors.

**BILATERAL EXCLUSION PERFORMED TO CONVERT A FECAL INTO A MUCOUS FISTULÆ.** In a patient with mucous colitis, the transverse colon and upper portion of the ascending colon were resected, and an anastomosis between the cecum and sigmoid was abolished. On the right side the cecum and remains of the ascending colon were bilaterally excluded, being supplied with a fistula which had been there for some time (Fig. 50).

After the operation the pain in the descending colon became so severe that it was necessary to establish a fecal fistula at its summit. The bilaterally excluded portion of the intestine gave no pain.

In another case, several fecal fistulae developed in the right iliac fossa after drainage for a gangrenous appendicitis. Believing that these fistulae were of the cecum, the surgeon having charge of the case before it reached Oppel performed an ileosigmoidostomy and applied a ligature to the distal portion of the ileum (Fig. 51). The escape of feces through the fistula continued. This was explained as either being due to the ligatures gradually cutting through and allowing the lumen of the intestine to again become patent or to retrograde movement of the feces or perhaps both. As seen in the diagram (Fig. 52), Oppel made an ileotransversostomy (side-to-side) and divided the colon close to the hepatic flexure. In spite of this, feces continued to escape from the fistulae and apparently there was a communication between the rectum and the cecum so it was decided to resect the excluded portion of the gut, *i. e.*, cecum and ascending colon. This operation proved that the fistulae were not in the cecum but in the supposedly excluded part of the ileum and that there was a communication between the latter and the pelvic colon (Fig. 53). The cecum and the ascending colon were found packed with fecal masses, the ileum communicating with the rectum was not able to empty the cecum (Fig. 53). A glance at the diagrams (Figs. 53, 54) will show that the condition just described is practically identical with that established by Monprofit's operation (Fig. 54), in which the ileum is divided and both proximal and distal ends are implanted into the sigmoid. Oppel believes that the ileocecal valve prevents the cecum from becoming empty. He operated upon such a case (Fig. 54) in which there was a peritonitis originating from the loop of the ascending colon, which, together with the cecum, was extremely distended.

As a substitute for Monprofit's operation, Oppel suggests dividing the ileum and uniting its proximal end with the beginning of the descend-

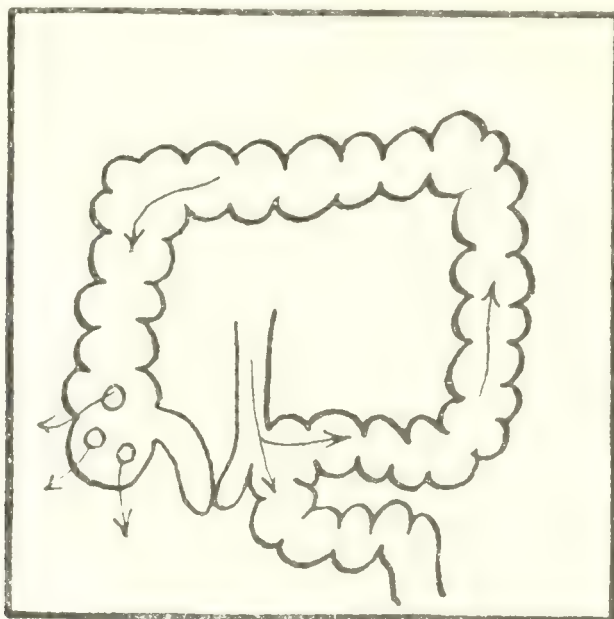


FIG. 51.—Believing that several fecal fistulae after drainage for gangrenous appendicitis were communicated with the cecum another surgeon before Oppel made an ileosigmoidostomy and applied a ligature to the distal portion of the ileum. The feces continued to escape.

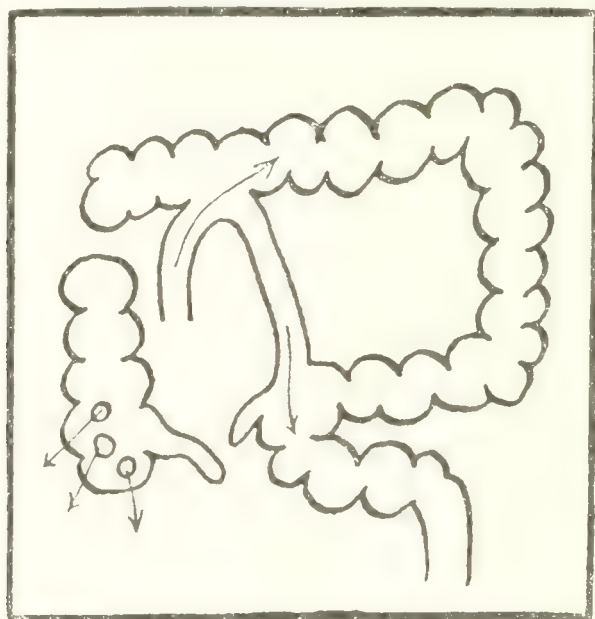


FIG. 52.—Oppel had the impression that escape of feces was due to reestablishment of the ileal lumen (cutting through of ligature) or to retrograde peristalsis. He made an ileotransversostomy (side-to-side) and divided the colon close to the hepatic flexure, as shown in this diagram. The feces still kept escaping.

ing colon and establishing a mucous fistula at the upper end of the ascending colon, holding in mind the possibility of a subsequent resection of the totally excluded cecum and ascending colon (Fig. 55).

Oppel next considers the problem in which resection of the whole of the entire large intestine is indicated, but, for one reason or another, the

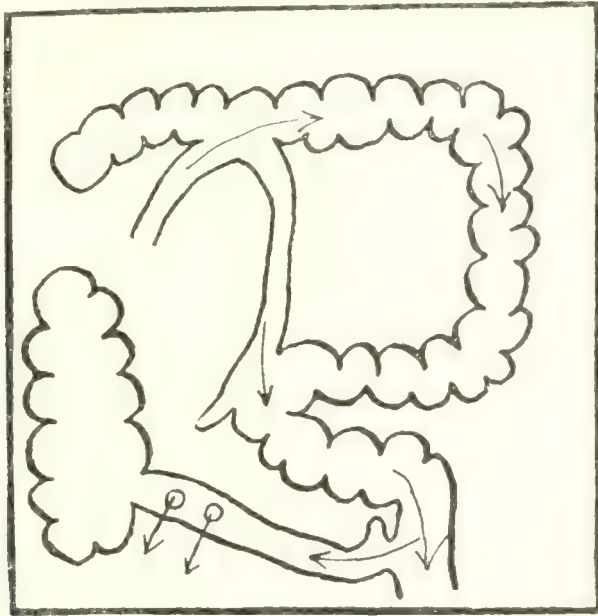


FIG. 53.—Apparently there was a communication between the rectum and the cecum. Resection of the excluded cecum was decided upon; now it was discovered that the true condition of affairs was an ileal segment connecting the rectum and cecum; the latter was packed with feces because the ileocecal valve prevented any reflux into the rectum. The fecal fistulae were situated in the communicating ileal loop.

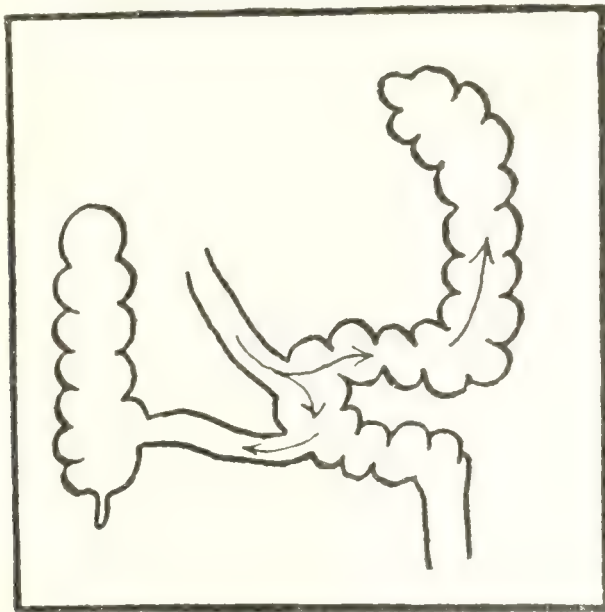


FIG. 54.—Monprofit's operation will produce almost the same condition shown in the above illustration. The ileocecal valve prevents the excluded gut from emptying itself. (Oppel.)

condition of the patient does not permit such a measure. Two methods are available. In one, the large intestine may be excluded unilaterally by ileosigmoidostomy or ileorectostomy, with establishment of a fistula



at the top of the cul-de-sac (Fig. 56), or, the method recommended by De Quervain, in which ileorectostomy or ileosigmoidostomy is estab-

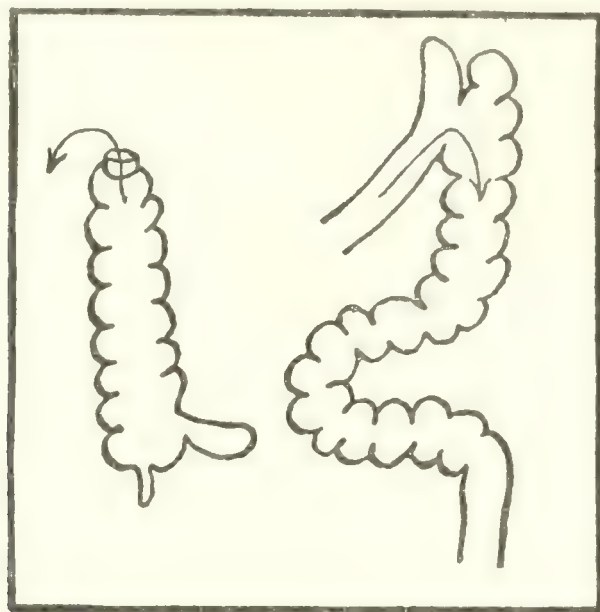


FIG. 55.—Oppel's proposed substitute for Monprofit's operation; the ileum is divided and its proximal end is united with the beginning of the descending colon; a mucous fistula is made at the upper end of the ascending colon; with resection of the excluded part of the gut as a possible eventuality.

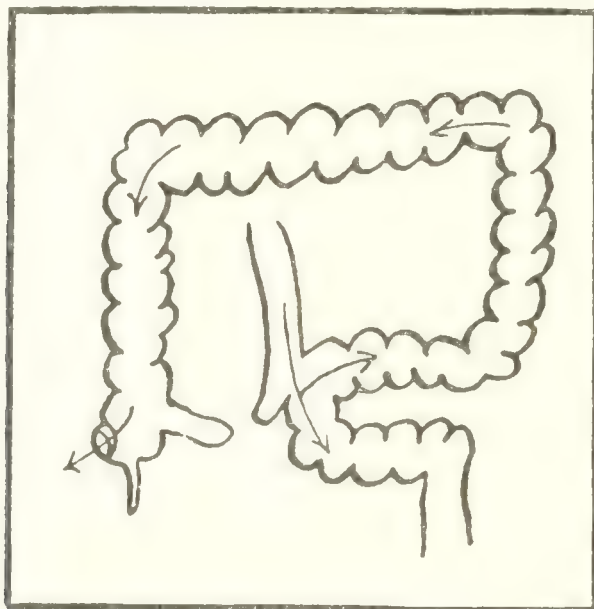


FIG. 56.—The whole large intestine should be resected but the patient's condition forbids; Oppel's ileosigmoidostomy with a vent (fistula) at the blind end is shown here. (The next diagram presents a better solution. [Reviewer.] )

lished, after which the large intestine is divided just above the anastomosis and its proximal end is brought to the surface as a vent (mucous fistula for the excluded bowel) (Fig. 57).

Eastman<sup>1</sup> also makes the point brought out by Case and by Oppel, that the ileocecal valve prevents drainage of the caput coli after a side-to-side ileosigmoidostomy. Speaking of the side-to-side cecosigmoidostomy which he and Yeomans advocate (practically a Giordano-Bergmann operation) he says, "unless the colon is hopelessly enveloped in dense membranes, the purpose of a well-planned short-circuiting operation should be, not to put the colon out of commission, but, by relief of colitis and pericolitis through drainage, to put the colon back in commission." He also advocates colocostomy for obstruction at the hepatic or splenic flexure. The Troyanoff-Winiwarter sigmosigmoidostomy is recommended<sup>2</sup> for exclusion of redundant sigmoid which causes obstruction.

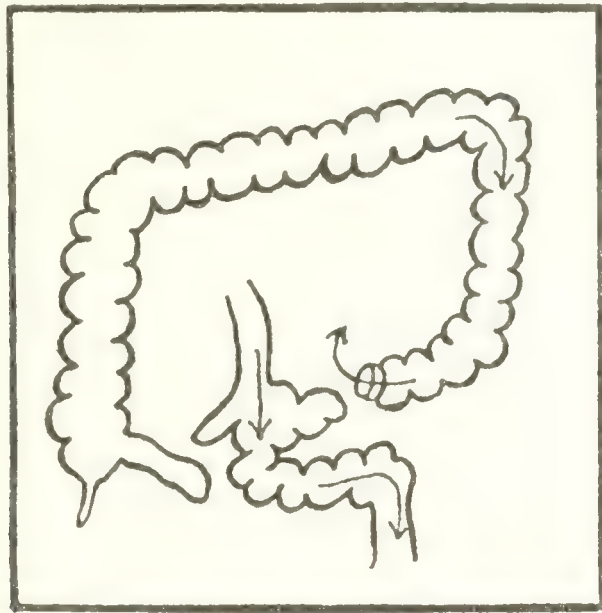


FIG. 57.—De Quervain's method—after establishment of an ileosigmoidostomy, the large intestine is divided just above the anastomosis and its proximal end is brought to the surface as a vent. (Oppel.)

Bonifield<sup>3</sup> reports 6 cases of ileosigmoidostomy with complete relief two or more years after operation. He does not state whether the anastomosis was end-to-side or side-to-side, and gives no *x*-ray studies after operation.

**THE TECHNIQUE OF COLECTOMY FOR CHRONIC INFLAMMATION.** Lardennois<sup>4</sup> proposes the following steps as improvements: (1) Separation of the great omentum from the transverse colon and the mesocolon with its conservation (Figs. 58 and 59); (2) ligation of the main branches of the colic vessels rather than serial mass ligation of the mesentery of the colon; (3) the Trendelenburg position after freeing of the colon has been

<sup>1</sup> Journal of American Medical Association, lxii, p. 747.

<sup>2</sup> Ibid., pp. 441 and 1786.

<sup>3</sup> Ibid., p. 444.

<sup>4</sup> Jour. de Chir., 1914, xii, p. 701.

finished, and during the actual steps of resection and anastomosis; (4) the employment of a subcecal colectomy (Fig. 61), with an anastomosis

FIG. 58

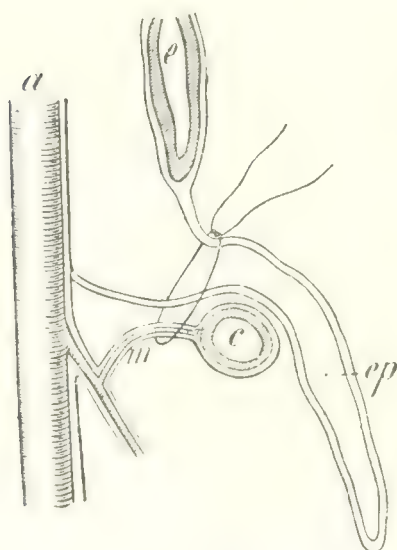


FIG. 59

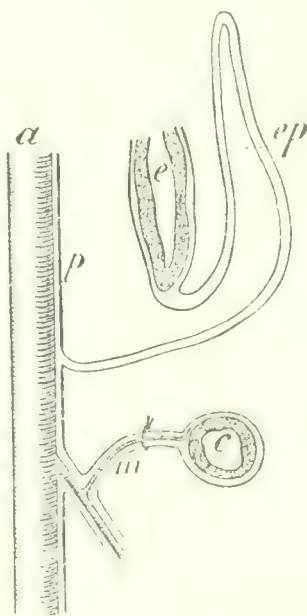


FIG. 58.—Ordinary ligation of the transverse mesocolon with the great omentum. Bad technique. (Lardennois.)

FIG. 59.—Proper ligation of the transverse mesocolon with the omentum dissected off and lifted up. Good technique. (Lardennois.)

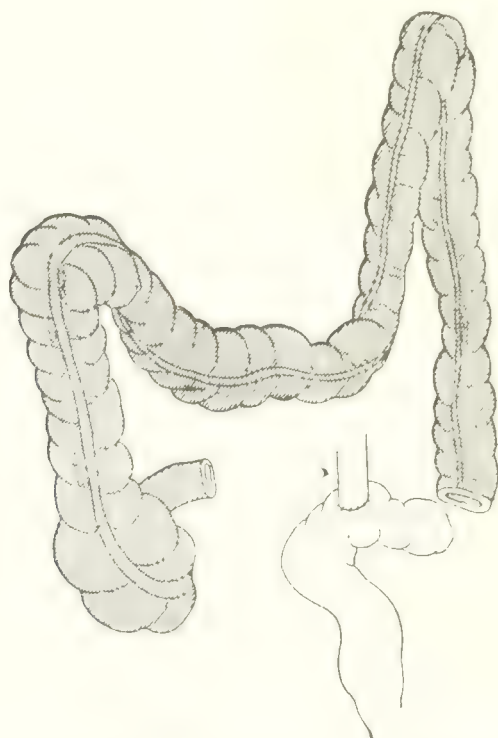


FIG. 60.—Total colectomy. Ileosigmoid implantation. (Lardennois.)

between the cecum and the sigmoid, thus preserving the ileocecal valve and preventing reflux of intestinal contents into the lower ileum.



With the patient under general anesthesia, in the horizontal position, a median incision 20 to 22 cm. long is made, one-third being above the umbilicus and two-thirds below. The great omentum and transverse colon are brought outside the abdominal cavity. The omentum is lifted. The line of junction of the omentum and colon is marked by fine folds in the peritoneum. The assistant pulls the omentum and the colon in opposite directions, keeping the omentum spread out on his open right hand while his left hand twists the colon from above downward. The operator taking the omentum in his left hand passes a bistoury over the fine folds along the line of junction from the left to the right end of the transverse colon. The space thus opened up is

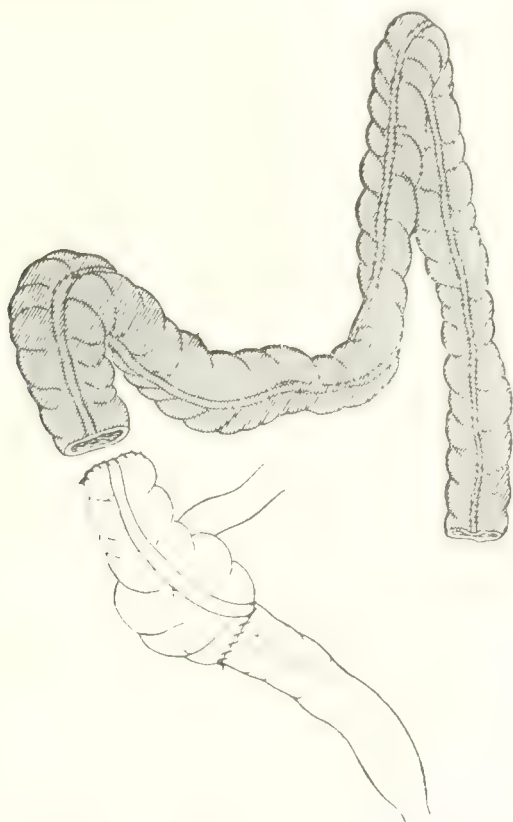


FIG. 61.—Subcecal colectomy. End-to-end typhlosigmoid anastomosis after resection of the base of the cecum. (Lardennois.)

enlarged by the finger, the assistant holding the parts aside as they are separated. The dissection commences on the colon and is continued on the mesocolon becoming easier as the posterior wall of the abdomen is approached. Soon the omentum is laid aside at the upper angle of the wound and the entire superior surface of the mesocolon is exposed to view. The left index finger following up the mesocolon comes to the suspensory ligament of the splenic flexure, which, being non-vascular, can be cut by the knife without any danger to the mesocolon or its vessels. The splenic flexure is thus detached and lowered. The dissection of the parietal peritoneum is followed toward the median line as far as desirable. The right flexure is freed in the same manner by

elevating the transverse colon with its mesocolon. The right, the left, and the middle colic arteries can be seen outlined on the thin mesocolon. A ligature of No. 0 catgut is placed on the vessel to which hemostats are applied a short distance distal to them and division is made between. These clamps are applied to prevent hemorrhage from the gut about to be resected. The transverse, ascending, and descending portions of the colon freed from their mesocolon are now raised up. They are still fixed at the extremities with the cecum and the sigmoid. The patient is now placed in the Trendelenburg position which allows the mass of small intestine to fall up out of the way, together with the great omentum. The sectioning of the colon at the sigmoid and at the ileum or cecum brings out nothing new. When the cecum is preserved, the upper end is first closed, then the appendix is resected, and the calibre of the sigmoid is compared with that of the cecum. If the sigmoid be large, an end-to-end anastomosis is done. If not, a side-to-side anastomosis. Lardennois does not practice colectomy for simple chronic intestinal stasis if the colon is found practically normal. He only performs it when chronic colitis has caused degeneration of the wall of the colon and extensive adhesions.

He points out the disadvantage of the old-fashioned colectomy (Fig. 58), in which the great omentum is resected, as well as the colon, by means of a series of mass ligature. This leaves the strangulation of irregular areas of tissue. These areas remain painful for a long time after operation even when covered with peritoneum.

"When the mesocolon is sectioned near its origin (Fig. 59), it leaves only a small incision situated deep down so that no peritonization is necessary." Another disadvantage of ligation *en masse* of the mesocolon and great omentum is that it brings the greater curvature of the stomach into juxtaposition with the transverse mesocolon. The tension caused by the ligatures and the cicatricial contraction following operation are doubtless the cause of the gastric trouble so frequently following colectomy.

Similar technical improvements in *Resections of the Colon for Malignant Neoplasms* have been suggested by Clairmont<sup>1</sup> as a result of anatomical studies on the cadaver and from observation of the late results in operations for carcinoma of the large intestine.

The necessity of more extensive removal of tissue is recognized. The suggested operation has as its object: (1) The total extirpation of the corresponding mesentery; (2) the extirpation of the regional lymph nodes around the main nutrient vessels; (3) the extirpation of the lymph nodes around the aorta. To accomplish total extirpation of the mesentery, a ligation of the main nutrient vessel should be made as close as possible to its departure from the main superior or inferior mesenteric

<sup>1</sup> Verhändl. d. Deutsch. Ges. f. Chir., 1914, i, p. 248.

artery. In the course of dissection of both of these main arteries, which are readily recognized, the duodenum is exposed. As the operation proceeds, the duodenum is mobilized and turned upwards, thus exposing the aorta surrounded by the fatty tissues so rich in lymph nodes. Clairmont has had the opportunity of carrying out these procedures upon the operating table. He found their technical accomplishment surprisingly easy.

Ssapeschko<sup>1</sup> advocates the following treatment for tumors of the large intestine. He first anastomoses, then waits a month before he resects. After one to one and a half years, he insists that the patients return for a relaparotomy for the sake of removing local recurrence if any has occurred. In one case the author made two relaparotomies and each time found small recurrences which were removed.

**A TEMPORARY INTESTINAL FISTULA AFTER ILEOCECAL RESECTION.** The advantage of this is to permit free drainage of the hitherto obstructed gut above the site of anastomosis, and not subject the suture line to undue intestinal distention.

Reder,<sup>2</sup> of St. Louis, performed a side-to-side anastomosis (ileocolostomy) after accomplishing his resection. As shown in the diagram, the end of the ileum which has been temporarily closed, is brought out either through a convenient spot in the abdominal wound or through a separate stab wound. It acts as a vent for a few days and through it a modified Paul's tube may be introduced into the lumen of the ileum down to the anastomotic opening leading into the colon, and through this a colon tube may be readily introduced for the purposes of irrigating the large bowel. Reder states that the artificial anus usually closes within several weeks without the aid of a major operative measure.

**Prolapse of the Intestine through Fecal Fistulæ and Artificial Ani, with Special Reference to the Bicornate "Hammer Type" of Franz Koenig.<sup>3</sup>** In the large fecal fistulæ or artificial ani, that part of the intestine lying directly opposite the opening (that part of the wall close to the mesenteric margin as a rule), protrudes through the opening. In the course of time this forms a sac coated externally with mucosa and lined internally with serosa. Into this sac, loops of small intestine may escape from the abdomen, and may become incarcerated in this situation. Such cases are difficult to recognize clinically, and may be very difficult to operate upon. Even more complicated are those cases in which the intestinal wall, by prolapsing still further, leads to the development of prolapse of adjacent parts of the proximal and distal intestine. (This condition has been described by Barth in a case of Meckel's diverticulum open at the umbilicus.) Such a prolapse of the intestine has consequently two horns. It has a mucous covering throughout which

<sup>1</sup> Zentralbl. f. Chir., 1914, p. 1323.

<sup>2</sup> Surgery, Gynecology, and Obstetrics, July, 1914, p. 96.

<sup>3</sup> Schmidt, Deutsch. Zeitschr. f. Chir., cxxvi, p. 387.



merges with the skin of the abdominal wall at the margins of the fistula. Of the two stomata of intestine, the afferent exudes intestinal contents.

Schmidt's patient was a woman of sixty-nine, with a cecal fistula. In this case a typical bicornate prolapse occurred, the ileocecal valve forming one stoma, and the ascending colon the other. The appendicular opening is visible in complete prolapse of the cecum.

**Prolapse of the Rectum.**—A rather complicated operation is described by Jurasz.<sup>1</sup> A child, aged three and a half years, had a rectal prolapse 7 to 10 cm. long; it was reducible. With the patient lying upon his face, an incision was made from the third sacral vertebræ down to the anal region. The anus was closed with sutures to assure asepsis. The coccyx and the attachment of the numerous ligaments at the sacrum were exposed, as well as the sphincter. The rectum was then completely freed by blunt dissection as high up as possible. A few reefing stitches were placed around its entire circumference in a transverse direction, thus shortening the gut. Strips of fascia taken from the fascia lata were now fastened to both sides of the rectum so that only narrow strips on the anterior and posterior walls were left uncovered by the fascia. By means of these fascial attachments, the rectum was pulled up as high as possible and fastened to the anterior surface of the tuberosacral ligament. The rather relaxed sphincter was then reefed by a few sutures of its posterior aspect. The patient made an uneventful convalescence, and, during the three and a half months subsequent observation there was no recurrence. The Moschcowitz operation<sup>2</sup> would have accomplished the same purpose with far less risk and with fully as good a prospect for permanent cure.

**Metastatic Carcinomata of the Rectum mistaken for Primary Growth.** Oehler<sup>3</sup> reports 4 cases in which autopsy revealed the primary growth in the stomach. The secondary deposits were the only ones which evoked symptoms and which led to operation in this region. Oehler states that the secondary deposits differ from primary growths in that they are covered with mucous membrane and consequently are not associated with the discharge of blood, mucus, and pus.

**The Combined Operation for Carcinoma of the Rectum** is described in great detail by Miles,<sup>4</sup> of London. The various points in technique are brought out with gratifying clearness and for this reason they are described below. The combined operation, however, has too great an immediate mortality to justify its adoption as a routine. The abdominal and perineal stages should be carried out at separate sittings.

The *abdominal portion* is carried out by Miles as follows: An incision extending from the centre of the pubes to the umbilicus is made about a quarter of an inch to the left of the median line. Miles prefers this

<sup>1</sup> Zent. f. Chir., 1914, p. 551.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1913, p. 148.

<sup>3</sup> Zent. f. Chir., 1914, p. 458.

<sup>4</sup> British Journal of Surgery, October, 1914, p. 292.

to the one in the left linea semilunaris because it affords greater facilities for pelvic dissection on the right side, and, secondly, because it permits of the incision for the colostomy being made at some distance from the main wound so that the latter can be adequately protected from fecal soiling during the subsequent progress of the case.

By means of a self-retaining abdominal retractor, the edges of the wound are widely retracted. A rapid survey of the abdominal cavity is now made with a view to ascertaining the possible presence of extramural spread. The pelvic mesocolon is carefully examined for nodules or tracts of growth. According to Miles, the most common position in which these are to be found are, (a) along the parietal border in the course of the superior hemorrhoidal and inferior mesenteric vessels; (b) along the margin attached to the colon where the paracolic lymph glands exist; and (c) in the substance of the mesentery itself anywhere between these two lines. If even quite minute nodules are discovered, this may be considered direct evidence that widespread extramural extension has taken place and the case had better be deemed inoperable, because recurrence is almost certain to appear higher in the median chain of the lumbar glands or, in the small intestine, as a result of contact. Naturally, the failure to find evidence of visible spread in these situations does not necessarily mean that there is an absence of extramural extension.

Not much is to be gained by inspection of the liver, because, according to the experience of Miles, if there is recognizable disease of the liver, there is nearly always obvious extramural disease in the pelvis or in the peritoneum, and if the latter is still in the microscopical stage, then any existing disease in the liver is too small to be recognized, except by postmortem examination.

Finally, the attachment of the diseased part of the bowel should be examined. If the growth is situated upon the anterior wall of the bowel, especial attention should be paid to possible involvement of the bladder in the male, or the posterior wall of the vagina in the female. In either of these circumstances, Miles considers the condition inoperable. He believes that if the bladder is involved, it is not possible to remove the growth completely; and, if the vagina is implicated, the additional operation of removal of the uterus and posterior wall of the vagina entails too severe a strain upon the patient's endurance.<sup>1</sup>

If no contraindication for operation is discovered, extirpation is then begun. Inasmuch as one of the chief factors for the ultimate success of this procedure is the rapidity with which the various steps of the procedure are carried out, it is of the greatest importance to clear

<sup>1</sup> This is in contradistinction to the views of certain Continental surgeons who remove the uterus and adnexa together with the carcinoma of the rectum *en bloc*. (See PROGRESSIVE MEDICINE, June, 1912, p. 128.)

the pelvic cavity of small intestine. The patient is, therefore, placed in high Trendelenburg position. If the patient takes the anesthetic comfortably, the small intestine usually drops out of sight into the upper abdomen. But in many instances this does not happen, and the operator is constantly embarrassed by loops of small intestine being forced down into the pelvis by respiratory movements. Under these circumstances Miles does not hesitate to pull all of the available small intestine out

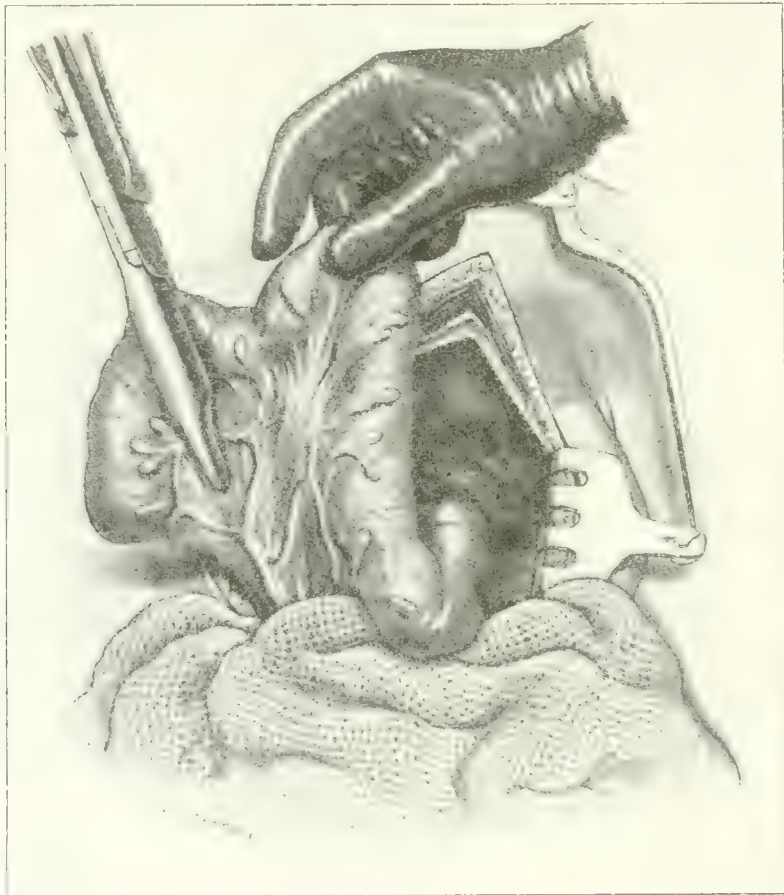


FIG. 62.—Crushing the pelvic colon at the seat of election. The patient is in the Trendelenburg position. The margins of the abdominal wound are widely retracted by a self-retaining claw retractor. The pelvic colon is drawn through the wound and the distribution of the vessels in the mesocolon displayed. A crushing clamp (author's pattern) is applied to the part of the bowel supplied by the loop of anastomosis between the first and second sigmoidal branches of the inferior mesenteric artery. (Miles.)

through the wound and to allow it to hang down outside the abdomen covered by warm, wet gauze compresses (Fig. 62). From time to time such a compress is renewed. Miles has done this frequently and has never seen any harm result therefrom. The pelvic colon is drawn into the wound and the position of its vessels noted. If adhesions exist, they should be freely divided on the outer side of the pelvic mesocolon so as to mobilize the pelvic colon and thus permit of its proximal portion



being subsequently utilized in the formation of the colostomy without undue tension.<sup>1</sup>

A point in the bowel is then selected between the anastomotic loops of the first and second sigmoidal branches of the inferior mesenteric artery. To this point an intestinal crushing clamp is applied (Fig. 62), and left on for a couple of minutes. In very stout subjects it may be difficult to observe the exact distribution of the bloodvessels in the mesocolon. Under such circumstances the safer plan is to place the clamp somewhat nearer the middle of the loop than otherwise. (The clamp which Miles uses has a blade about one inch wide.) Upon removal of the clamp, a stout ligature is then passed through the mesocolon at each extremity of the crushed area, and tied tightly, thus firmly occluding the lumen of the gut in two places (Fig. 63). The crushed

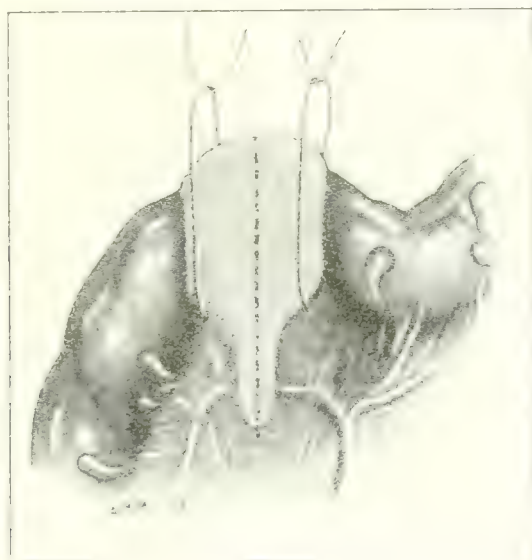


FIG. 63.—Showing the crushed area of the bowel after removal of the clamp. A ligature is passed through the mesocolon close to the bowel on either side of the crushed area, and tied firmly. The interrupted line indicates the incision to be made through the crushed bowel and adjacent portion of the mesocolon. (Miles.)

portion of the bowel is now divided with scissors, the cut extending into the crushed portion of the mesocolon (Fig. 63, dotted line). The ligatured ends of the bowel are then invaginated by means of a purse-string suture, the attachment of the mesocolon to the bowel having first been divided for a short distance, close to and parallel with the bowel (Fig. 64), in order to render the invagination easier. The distal end of the bowel must be carefully closed, to prevent the possible escape of its contents during the manipulation of this portion of the intestine in the subsequent steps of the operation.

<sup>1</sup> The division of the peritoneum to the outer side of either the ascending or descending colon is used by all operators of experience for mobilizing those parts of the large intestine, thus making them more accessible when operating through a median incision. (Reviewer.)

An incision is now made through the peritoneum on the outer aspect of the pelvic mesocolon, at the level of the left sacro-iliac synchondrosis, along its parietal border. Through this incision the left ureter is defined as it crosses the left common iliac artery (Fig. 65). In this position the left ureter is parallel to, and in close contact with, the inferior mesenteric vessels, and, unless it is clearly defined and drawn aside, may easily be included in the ligature when the latter is applied to the vessels in this situation. The left ureter having been held aside by an assistant, a ligature is then applied to the inferior mesenteric artery at a point immediately below the origin of the first sigmoid branch (Fig. 65). In some instances a second sigmoid artery arises from a common branch with the first, in which case the ligature must be placed below the common trunk, and the second sigmoid artery will have to be ligatured

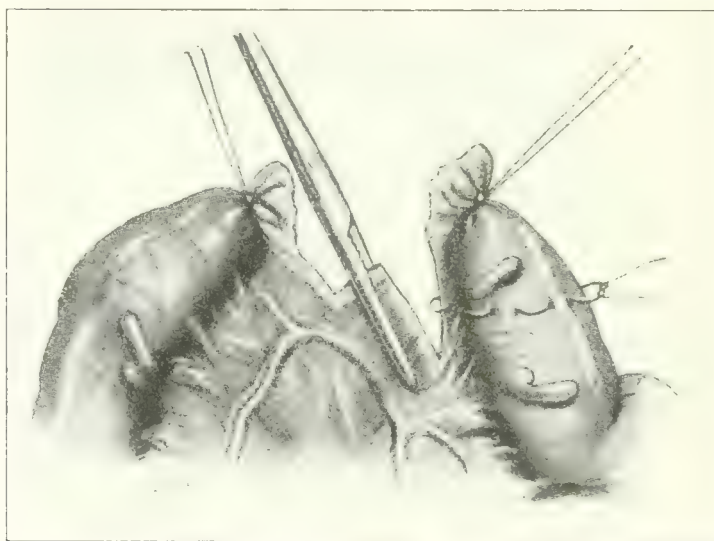


FIG. 64.—Treatment of the divided ends of the bowel. A hemostatic clamp is placed on the mesocolon, and an incision is made with scissors close to and parallel with the bowel for the distance of an inch. A purse-string suture is made to encircle the isolated extremity of the bowel, and the closed end is invaginated. (Miles.)

separately when the mesentery is divided. When the inferior mesenteric vessels have been ligated, the remainder of the pelvic mesocolon is divided, the inferior mesenteric vessels as they lie in its parietal border being also divided below the point of ligature. All bleeding vessels in the proximal portion of the pelvic mesocolon having been ligated, the proximal end of the colon is temporarily dropped into the abdominal cavity out of the way.

Commencing at the point where the pelvic mesocolon has been cut across, an incision is made through the peritoneum on each side of the attachment of the lower portion of the pelvic mesocolon, at a distance of about one inch from it. These incisions are carried down into the pelvis parallel to the mesocolon to the level of the peritoneal reflexion. The reason for making these incisions quite an inch away from the attachment of the mesocolon is because the lymphatic vessels, which

accompany the superior hemorrhoidal vessels, extend a little way beneath the peritoneum on either side, and on several occasions Miles has seen plaques of growth to one or other side of the line of attachment of the mesocolon. When these incisions have been made, the distal portion of the pelvic colon is drawn forward by an assistant and the connective tissue space in front of the concavity of the sacrum is thus

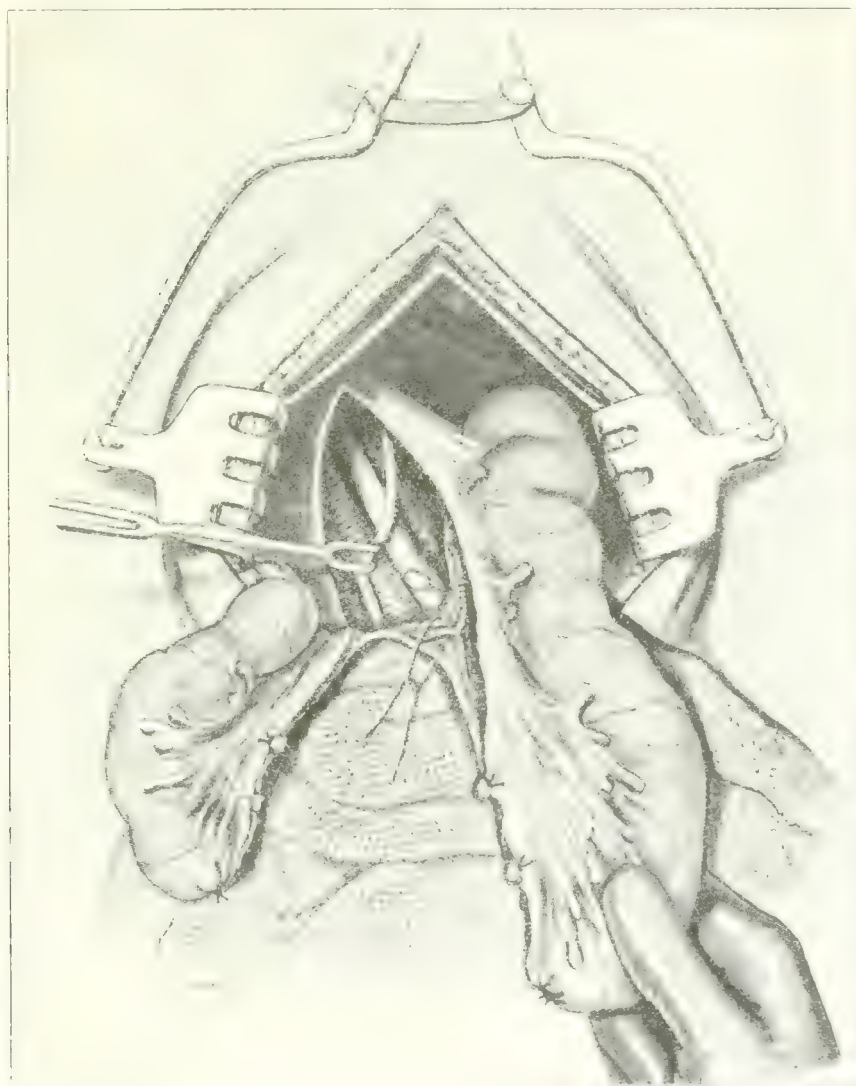


FIG. 65.—Showing complete division of the pelvic mesocolon and ligature of the inferior mesenteric artery at the seat of election. The portion of the bowel on the left-hand side is that from which the colostomy is eventually made. The incision in the peritoneum, carried forward on the left side, exposes the left ureter as it crosses the left common iliac vessels. The ureter is drawn aside while the ligature is placed around the inferior mesenteric vessels. (Miles.)

exposed. By inserting the fingers of the left hand into this space, the lower part of the pelvic mesocolon, with the contained bloodvessels and lymphatic glands, and the rectum ensheathed in the fascia propria recti, are readily detached from the ligamentous structures in front of the sacrum (Fig. 66). In doing this, care should be taken not to wound the median sacral vessels which course down the anterior surface of



the sacrum in the middle line. The separation of the rectum from the hollow of the sacrum should be carried down to the level of the sacro-coccygeal articulation, a point which can be readily recognized by the fact that the fascia propria recti is firmly adherent to the last piece of the sacrum and resists being stripped from it.

The preceding incisions in the peritoneum are now carried forward on each side of the pelvis to meet anteriorly behind the base of the bladder in the male, or the upper portion of the vagina in the female. In making

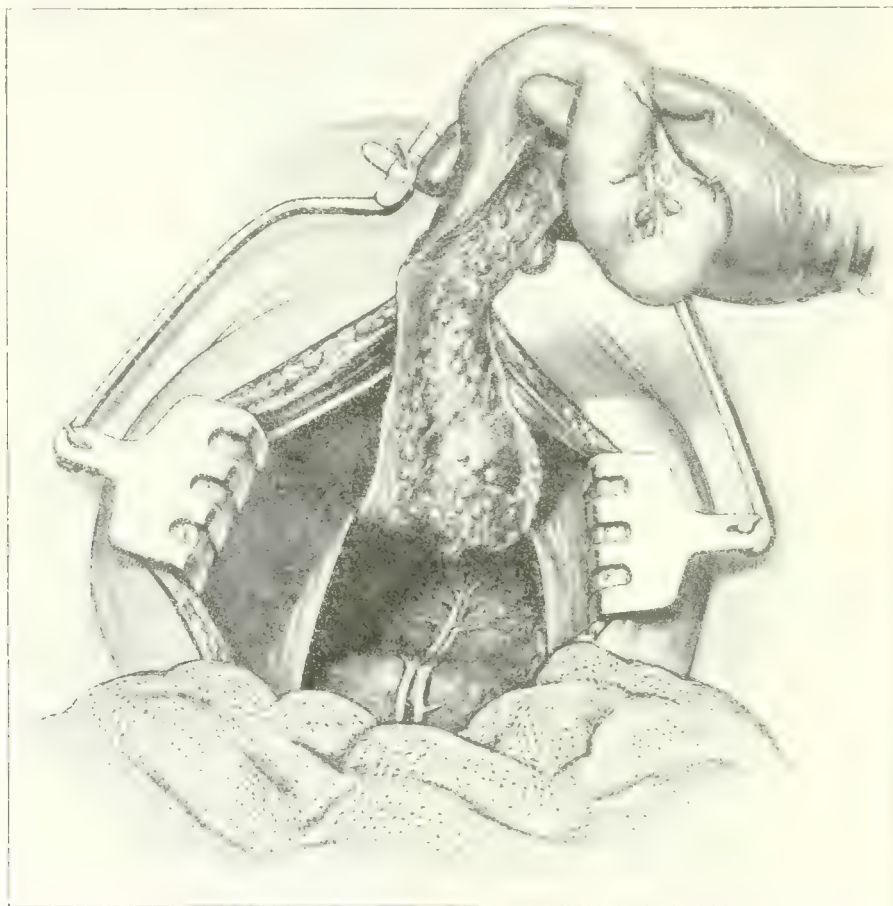


FIG. 66.—Showing the rectum and the rectorectal tissues separated from the hollow of the sacrum as far as the sacrococcygeal articulation. After ligation of the inferior mesenteric vessels, the remains of the pelvic mesocolon are divided below the ligation, and the incisions in the pelvic peritoneum are carried forward on either side along the lateral wall of the pelvis. The cellular space in front of the sacrum is opened up as far as the coccyx. (Miles.)

these incisions, special care should be taken to avoid injuring the ureters which are adherent to the parietal peritoneum as they skirt the lateral wall of the pelvis on their way to the bladder. The separation of the anterior wall of the rectum is now continued by means of blunt dissection. In the male, it must be separated from the bladder and from the vesiculi seminales as far as the upper border of the prostate. When doing this the vesiculi seminales and vasa deferentia are liable to be injured, therefore great care should be taken to avoid them. Unless the separation is carried down to the prostate, much difficulty will be

experienced in this situation during the subsequent perineal portion of the operation. In the female, the separation from the vagina is easily effected and need only be carried half-way down the posterior wall.

The isolation of the rectum from its lateral attachment is now continued, first on the left and then on the right. The left ureter should never be lost sight of, as it lies close to the left side of the rectum and may easily be injured. On the right side the ureter lies some distance away and should be left undisturbed in its attachment to the parietal peritoneum. This part of the isolation of the rectum is much the most difficult, on account of the presence of the lateral ligaments of the rectum. These are well-developed vertical bands of dense connective tissue having their origin in the rectovesical fascia, and extending from the lateral aspect of the rectum obliquely forward and outward toward the base of the bladder (Fig. 67). Each band is from one and a half to two inches in depth and is very strong. Unless they are completely divided on both sides as far as the levatores ani, much difficulty will be experienced in withdrawing the rectum through the peritoneal wound. Miles is convinced that it is the failure to completely divide these lateral ligaments during the abdominal part of the operation which renders the perineal portion an unnecessarily tedious and prolonged procedure. During the division of the left lateral ligament, the left ureter should be carefully protected from injury. In the substance of these ligaments the middle hemorrhoidal artery is contained and must be divided. As a rule, this vessel is quite small and seldom requires a ligature. Occasionally free bleeding is seen from it, but this is easily controlled. As this is the only artery arising from the branches of the internal iliac which is divided during the abdominal part of the operation, Miles does not understand why many text-books advise ligature of the internal iliac as a preliminary measure in abdominal extirpation of the rectum.

The rectum having thus been thoroughly freed in all directions— anteriorly, as far as the upper border of the prostate, or half way down the posterior vaginal wall, as the case may be; posteriorly, as far as the sacrococcygeal articulation; and laterally, down to the levatores ani—the whole of the isolated portion of the bowel is crowded down into the cavity of the pelvis, and preparations are made for reëstablishing the peritoneal floor of the pelvis. Owing to the free removal of peritoneum on each side of the pelvic mesocolon and of the peritoneal covering of the floor of the pelvis, a large gap remains. On no account should the pelvic mesocolon be left *in situ* with a view to facilitating the closure of this gap, because this is directly in the line of the upward spread, and is therefore to be considered highly dangerous tissue. Miles lays the utmost emphasis upon the necessity for completely removing this structure in every case, together with a wide strip of the adjacent peritoneum if immunity from recurrence is to be hoped for.

In the first place, the peritoneum from the lateral walls of the pelvis should be freely dissected up, care being taken to avoid injury of the ureters. After this has been done, it will generally be found that the posterior margins can be brought together in front of the promontory of the sacrum without undue tension, and can be sutured to the stump of

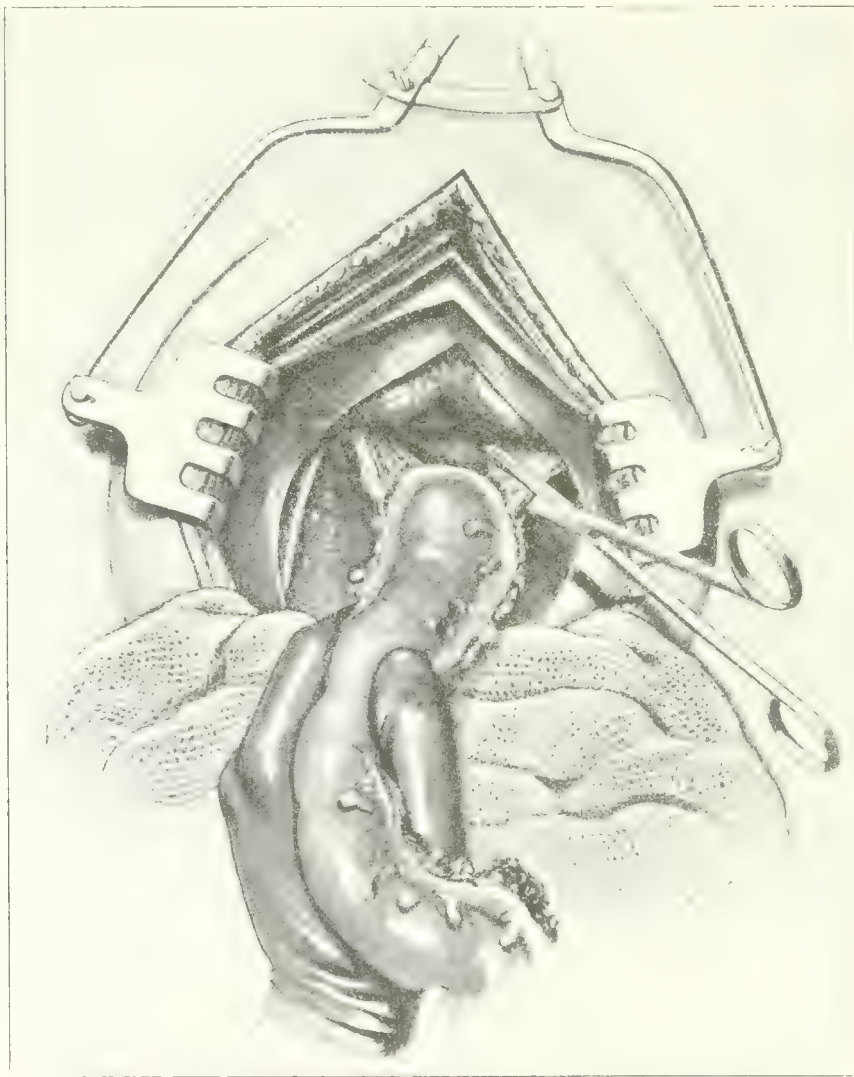


FIG. 67.—Showing the separation of the anterior connections of the rectum as far as the upper border of the prostate, and division of the lateral ligaments. The lateral incisions in the peritoneum have been extended on either side so as to meet in front behind the base of the bladder. The lateral ligaments have been defined as far as the upper surface of the levator ani on either side. These ligaments are then completely divided with scissors, the ureter on the left side having been drawn aside. (Miles.)

the pelvic mesocolon at the point where the inferior mesenteric vessels have been tied. This being completed, a large pear-shaped gap still remains to be closed, the lateral margins of which cannot possibly be approximated. This gap may be readily closed as follows: (*a*) In the male, by dissecting up a flap of peritoneum from the bladder and stretching it backwards across the gap and suturing it there (Fig. 68);



(b) in the female, either by making use of the uterus to fill up the gap, a method which Miles employed in his earlier cases but has since given up owing to menstrual trouble which have resulted in some instances; or by dissecting up the innermost layers of the broad ligament and utilizing them to fill up the space. The latter is the method now employed with satisfactory results.

In those instances in which the peritoneum is very delicate, great care must be taken to reinforce the suture line in those places in which there

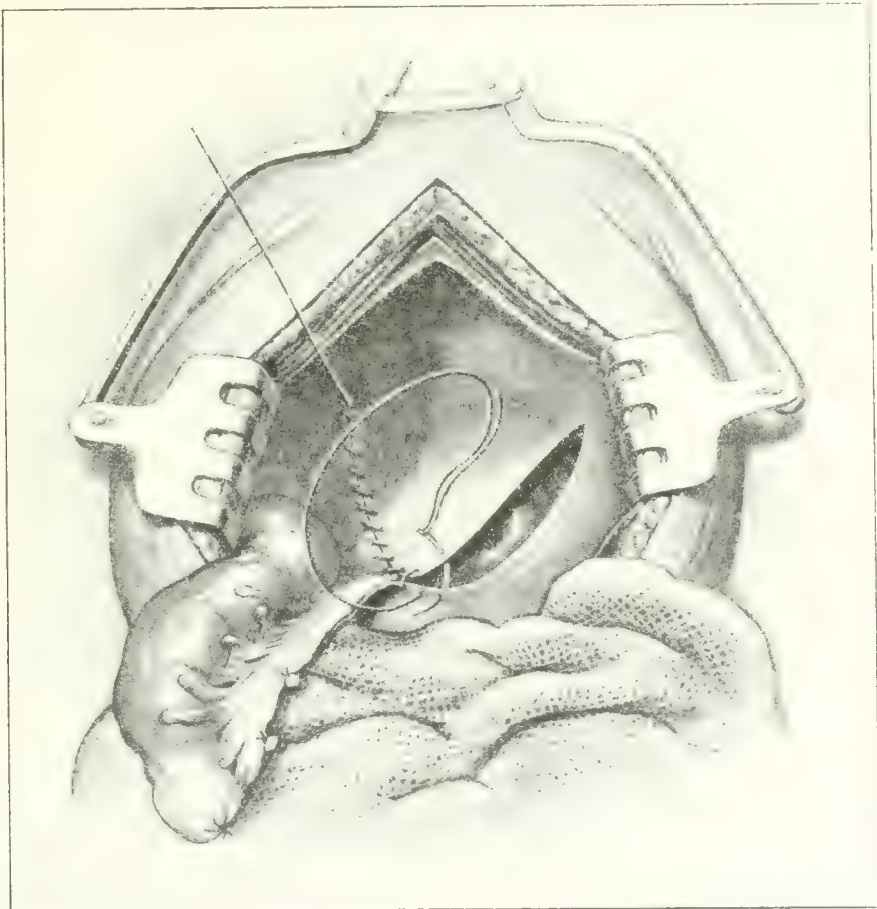


FIG. 68.—Showing method of restoring the pelvic floor of the male. A flap of peritoneum has been dissected up from the bladder and drawn backwards until it meets the cut edge of the pelvic mesocolon, to which it is sutured. On the right side the distal portion of the pelvic colon can be seen lying in the pelvic cavity below the new pelvic floor. (Miles.)

is tension and a possibility of the stitch puncture tearing. In one of Miles' cases a knuckle of small intestine became herniated through a small hole thus made and the patient developed intestinal obstruction from which he died. When the peritoneum is very delicate, the suture line may be advantageously strengthened by means of an omental graft.

The proximal end of the pelvic colon is now utilized for establishing a colostomy. The best position for this is at a point situated one and a half inches internally to the anterior superior spine of the ileum, along

a line extending from that bony prominence to the umbilicus. A short incision, one and a half inches long, is made, the centre of which intersects the above mentioned line at right angles. This incision extends through the skin and subcutaneous tissues only. The aponeurosis of the external oblique muscle is now divided to the extent of one inch and then the muscular fibers of the internal oblique and transversalis muscles are separated in the direction of their fibers by blunt dissection. An opening just large enough to admit the index finger is then made through the transversalis fascia and the peritoneum. Through this small opening the stump of the proximal end of the pelvic colon is drawn and fixed

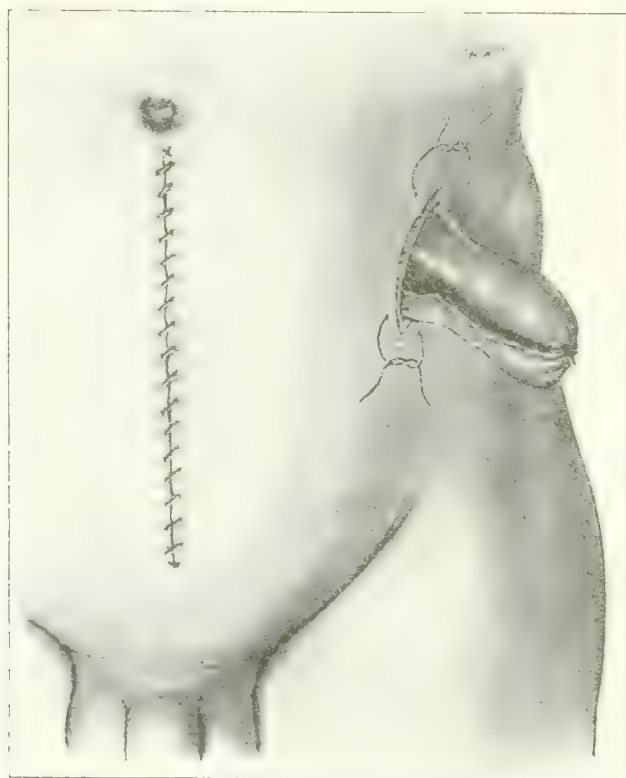


FIG. 69.—Showing method of fixing the proximal end of the pelvic colon to form the colostomy. The silkworm-gut suture at the upper angle of the wound has been passed beneath the anterior longitudinal band, and that at the lower angle has included the external longitudinal band. (Miles.)

in position at the upper and lower angles of the wound by means of silkworm gut (Fig. 69). Miles does not think there is any advantage in bringing the bowel out through the fibers of the left rectus muscle. The chief point to be borne in mind is to make the opening just large enough to allow the stump of the bowel to be drawn through, and no larger.

After introducing two or three pints of warm saline solution into the peritoneal cavity and replacing the contents, the abdominal wall is closed by layer suture, a temporary dressing and bandage is applied, the Trendelenburg position is dispensed with, the patient is turned into the right dorsal and semi-prone position in order that the perineal portion of the operation may be performed (Fig. 70).

*The Perineal Portion of the Operation.* The anus having been closed by means of a purse-string suture, a transverse incision about four inches in length is made at the level of the sacrococcygeal articulation. From the centre of this a longitudinal cut is made in the internatal furrow and carried down to a point one inch from the posterior margin of the anus. From the inferior extremity of this, incisions are carried to the right and the left of the anus in shape of a horseshoe, and the anterior extremities of these are joined by a transverse cut (Fig. 70). It is important that the arms of the horseshoe should embrace as wide an area of perianal skin as possible, because of the tendency to local recurrence in this region. The gluteal skin flaps are then dissected and retracted out of the way, thus exposing the coccyx.

The sacrococcygeal joint is opened and the coccyx dissected out; incisions surrounding the anus are then deepened so as to include the whole of the ischiorectal fat (Fig. 71). According to Miles, it is unnecessary to remove any of the sacrum as ample room is provided by simple removal of the coccyx. In fact, he states that sufficient room for the

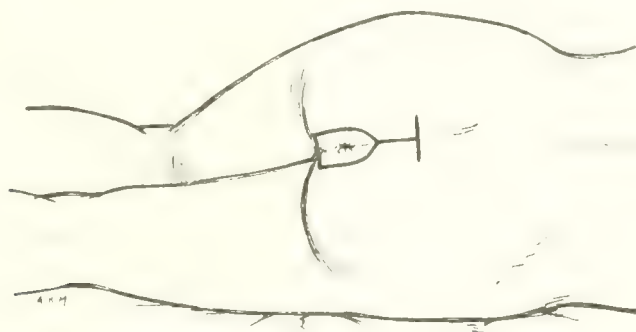


FIG. 70.—Showing outline of the incisions in the perineal region. (Miles.)

completion of the operation can be obtained without even removing the coccyx. However, he thinks it is best to remove it because the coccygeus muscle must be removed and this would leave the bone without any lateral attachment.

The presacral cavity, containing the isolated bowel, is exposed as follows: A small transverse incision is made into the dense connective tissue immediately below the sacrum where the attachment of the fascia propria recti can readily be detached from the ventral aspect of the lowermost piece of the sacrum. The index finger is then thrust into this, when, supposing that the separation of the rectum from the front of the sacrum has been carried down to the level advocated above, it readily passes into the space containing the isolated bowel. A transverse incision is then made through the coccygei muscles on either side, extending outward as far as the great sacrosciatic ligament. Through the ample opening thus made, the isolated bowel is drawn down to its full extent (Fig. 72). When the separation of the anterior connections of the rectum have been carried down to the prostate during the abdom-



inal part of the operation, the base of the bladder and the vesiculi seminales, with the vasa deferentia and the upper part of the prostate, come into view; in the female, the uterus and upper half of the posterior vaginal wall can plainly be seen.

By making traction upon the bowel with the left hand, the levatores ani are put upon the stretch. If they do not come into view, it is because the lateral ligaments of the rectum have not been completely divided from above. In that case considerable difficulty may be experienced in delivering the loosened bowel through the perineal wound, and, until

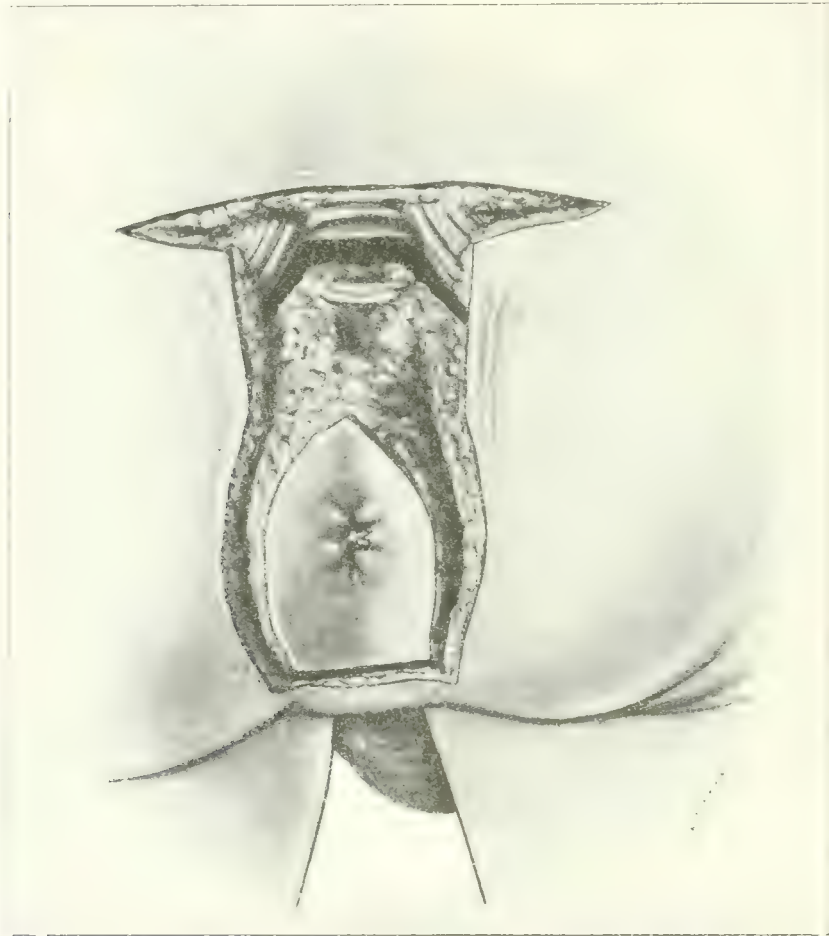


FIG. 71.—Showing the reflection of the skin flaps and opening of the sacrococcygeal joint. When the surface incisions around the anus are deepened, as much as possible of the ischioanal fat is included. (Miles.)

the lateral ligaments are completely severed, the levatores cannot be divided. The levatores are divided from their origin at the lateral wall of the pelvis, the puboprostatic fibers being dissected from the prostate. In those instances in which the growth is situated on the anterior wall of the ampulla of the rectum, Miles always makes a practice of dissecting away the prostatic capsule as well. All that now remains to be done is to dissect away the anterior wall of the anal canal from the tissues forming the central point of the perineum. Here great care must be taken not to wound the membranous portion of the urethra.

After the removal of the rectum and isolated portion of the pelvic colon, usually about sixteen inches in length, a huge cavity is left. This cavity is surrounded by bony structures behind and at the side, and it is absurd to suppose that it can be sewn up so as to obtain healing by primary union. The cavity must heal gradually by granulation, portions only of the skin incision being brought together by suture. Miles

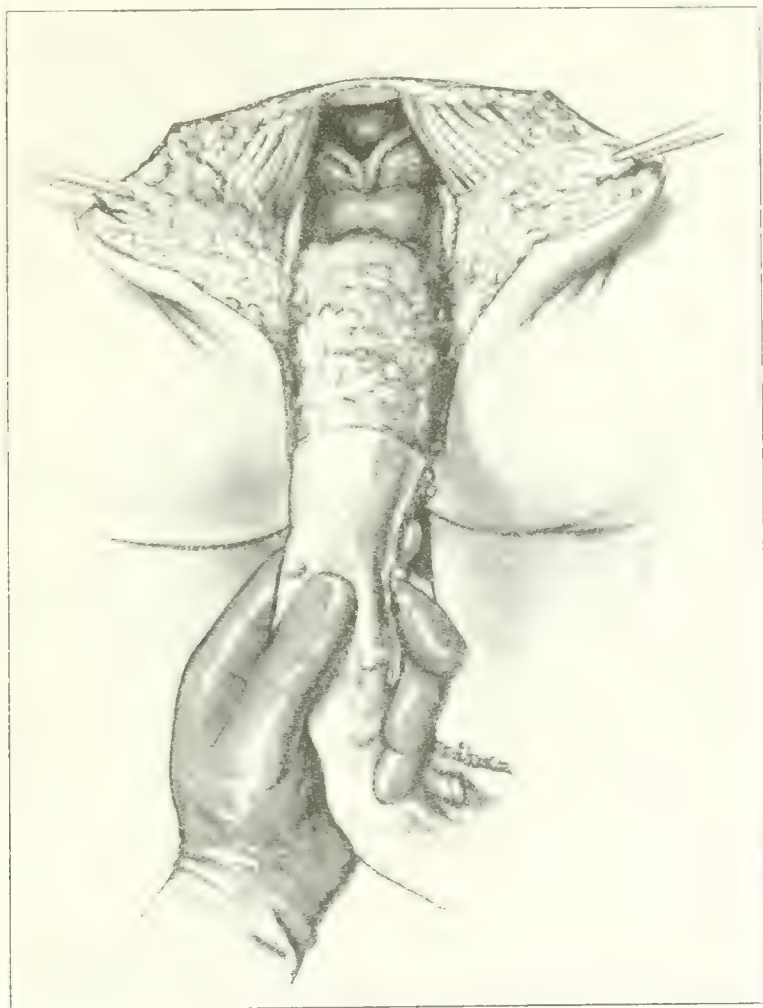


FIG. 72.—Showing the pelvic colon and the isolated upper part of the rectum withdrawn from the cavity of the pelvis. If the isolation of the rectum has been efficiently carried out anteriorly, posteriorly, and laterally, the bowel can be readily withdrawn, in the manner shown, and the base of the bladder, the vesiculæ seminales, with the vasa deferentia and the prostate gland, are clearly exposed to view. The levatores ani are then divided close to their origin from the pelvic wall. (Miles.)

always packs the cavity with a Milkulicz tampon in which a large sheet of rubber dam two feet square is substituted for the outer covering of gauze (Fig. 73), rendering the subsequent removal of the interior gauze easy and painless. In one of his earlier cases in which he did not use rubber dam, and consequently permitted gauze to come in contact with the peritoneal wound, the peritoneum of the pelvic floor was torn

upon removal of the gauze and a coil of small intestine became herniated through the opening.

Dressings and bandages are now adjusted, and the patient is turned upon his back so that the abdominal wound may also be dressed. Before the patient leaves the table the ligatures closing the stump of the proximal end of the pelvic colon are removed, and the open end of the bowel is covered with protective and a pad of gauze.

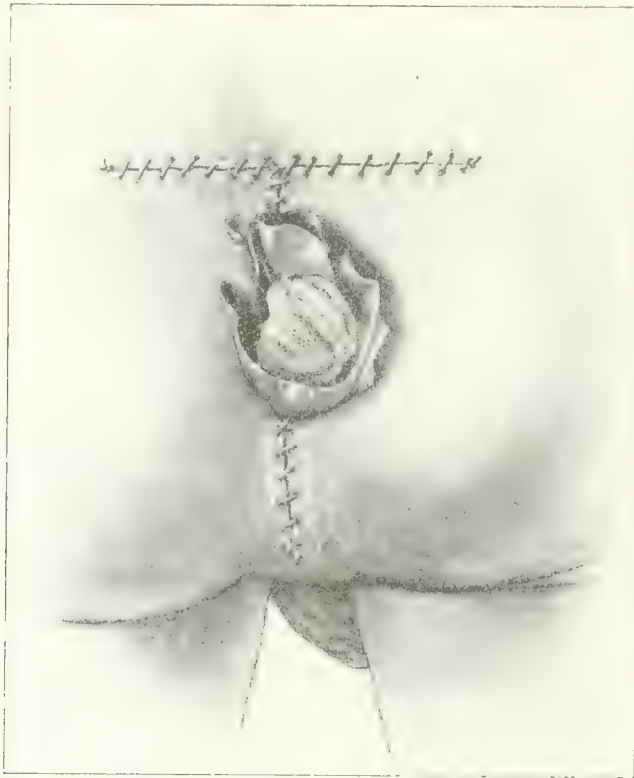


FIG. 73.—Showing the perineal wound closed, and a mass of gauze introduced in a sac of protective, so as to support the pelvic floor. (Miles.)

### LIVER AND BILE PASSAGES.

**The Diagnostic Value of the Chemical Examination of Duodenal Contents in Jaundice.** Crohn<sup>1</sup> reviews 120 analyses in a group of 52 cases; in all of these jaundice was present. The duodenal contents were gathered by means of the Einhorn duodenal tube two hours after the administration of a test meal. In 12 cases of *cholecystitis with cholelithiasis*, the bile, even when collected at the time of jaundice, was abundant, heavy, viscid and dark green, with an excess of mucus. In *catarrhal jaundice* (one case) an abundant, thin, yellowish bile was obtained.

*Impacted Common Duct Stone* (six cases). Bile was present in five and the pancreatic ferments were present in full amount. In one case obstruction was so complete that no bile entered the intestines; subsequently a very large calculus, firmly imbedded in the lower portion of the common duct was found. In other words it is extremely rare for stone to cause a complete obstruction.

<sup>1</sup> Journal of American Medical Association, vol. lxiv, p. 565.



*Stricture of the Common Duct* (three cases were studied). In all three, a biliary fistula had been established. In two, no bile was found, although pancreatic ferments were abundant. In the third case there was a fairly free flow of bile into the intestine. Here it was feared that a secondary newly-formed carcinoma of the bile duct was the cause of obstruction and failure of the biliary fistula to close. The results of the duodenal examination, which revealed the free flow of bile, removed this fear in part.

In *new growths not involving the pancreas* or its excretory ducts (these were usually carcinoma of adjacent organs involving the choledochus by direct extension) invariably there was complete absence of bile from the duodenum, but pancreatic ferments were unchanged (3 cases). Of *new growths involving the pancreas* and its ducts there were 11 cases. In these, there was complete absence of bile from the duodenum. This finding rendered the diagnosis an absolute one. In 6 cases there was complete absence of both bile and pancreatic ferments. In the remaining 5 cases, the diagnosis was more difficult because secondary ulceration of the new growth had allowed escape of some of the secretions which at first were wholly absent. Here, however, fever, intestinal hemorrhage and rapid emaciation corroborated the clinical diagnosis. In short, in the 14 cases of neoplasm, 13 presented a complete closure of the bile duct. Six cases gave the additional evidence of closure of the pancreatic duct.

In pancreatitis, diminished ferments were the rule (4 cases).

In 6 cases of *hypertrophic cirrhosis* of the liver, the bile in large amounts was found to be thin, light yellow and watery. There was no dilution in the strength of the pancreatic ferments. Of 3 cases of *syphilitic hepatitis* with jaundice, two showed no abnormality in the character of the bile or enzymes, while the third gave the typical chemistry of a hypertrophic cirrhosis. In *hemolytic jaundice*, the duodenal contents were normal; also in *pylephlebitis* and in *chronic endocarditis* with enlarged liver and jaundice.

The most important fact brought out in the examinations was that stone does not obstruct the common duct but that new growth does, and, in the latter case, total absence of ferments spells new growth.

In this connection the findings of Faulhaber<sup>1</sup> are of passing interest. He has found that no hypersecretion of the pancreas could be noted in the presence of callous ulcers of the stomach invading the pancreatic substance.

**Shortening the Time for Insertion of the Duodenal Tube.** By means of the following technique, Lippman<sup>2</sup> states that he is able to introduce the tube into the inferior genu of the duodenum within twenty-five minutes. Most of the work was done with the original Gross tube.

<sup>1</sup> Berliner Klin. Woch., 1914, No. 29.

<sup>2</sup> Journal of American Medical Association, vol. lxii, p. 911.

He now uses the heavy Gross bulb but a thinner tube. The fasting patient sits in a chair and swallows the olive of a freshly oiled tube with the aid of the physician's finger, if necessary. With the patient breathing rhythmically between swallows, the tube is allowed to pass in up to 45 cm. The patient holds the tube fast with his lips and then bends forward a moment before he lays himself on his right side with raised upper body. Now the tube is held lightly between the fingers and is fed into the stomach up to 70 cm. The tube is not really shoved in, but allowed to follow the pull of the heavy olive and of the respiratory movements. Then the gastric juice is aspirated and tested for its reaction. The patient remains five minutes longer on the right side with the tube held fast between the lips. Then he rolls over on his back, and without allowing him to sit up, a wedge-shaped cushion or a couple of pillows are placed beneath the hips. Five minutes later the tube is inserted up to the 30 cm. mark. After another five minutes the juice is neutral or alkaline. If, as in some cases, the aspirated juice still remains acid, it is advisable to have the patient sit up for a moment as the olive falls from the superior genu to the inferior. Very uncommonly juice aspirated from the inferior genu may be weakly acid.

**Cholecystectomy and its Influence upon the Gastric Secretions.** Boss,<sup>1</sup> from Küttner's Clinic, in Breslau, investigated 20 patients, from the results of which he cannot substantiate the opinion of Hohlweg that retention of bile is followed by hyperacidity, while an acidity or great decrease in secretion of acid follows a drainage of bile. Two cases were particularly interesting of this series, in which the hydrochloric acid rose almost to normal after extirpation of the gall-bladder, whereas, previous to operation, there was none or almost no free acid.

**Cholecystitis without Stones or Jaundice.** In half a dozen cases operated upon in the Mayo Clinic, it was observed that after cholecystostomy had been done for chronic cholecystitis without stones and with a complicating chronic pancreatitis, the patient was relieved for some weeks or months, but then the symptoms returned. The gall-bladder was therefore reopened. As long as drainage was maintained there was relief, but the symptoms returned as soon as drainage ceased. Upon removal of the gall-bladder, however, the symptoms were promptly and permanently relieved. W. J. Mayo<sup>2</sup> believes that in the presence of chronic pancreatitis without jaundice and without evidence of back pressure on the biliary tract, the gall-bladder should be removed if it shows marked evidence of chronic cholecystitis, especially of the strawberry type.

**Infection of the Bile Passages by Streptococci.** Rosenow<sup>3</sup> says "the common presence of streptococci in the wall of the infected gall-bladder

<sup>1</sup> Berliner klin. Woch., 1913, No. 52.

<sup>2</sup> American Journal of the Medical Sciences, April, 1914.

<sup>3</sup> Journal of American Medical Association, lxiii, p. 1835.

and in the centre of gallstones, often in pure culture, while absent from the bile, and their affinity for the gall-bladder in animals, are strong evidence that streptococci are the cause of cholecystitis in man far more frequently than believed and serves to explain the good results reported by some as following cholecystectomy in cases of myocarditis, arthritis, and other conditions." This work requires confirmation before it can be accepted.

**Typhoid Bacilli Found in Gall-bladders Removed at Operation.** Meyer<sup>1</sup> found typhoid bacilli in 6 out of 70 gall-bladders removed for various reasons. Paratyphoid bacilli were found in another. As the records show that removal of the gall-bladder does not always put an end to the elimination of typhoid bacilli, such patients must be kept under observation until proven to be no longer carriers. Speaking of the latter, Küttner<sup>2</sup> says that stones are present in the gall-bladders extirpated from typhoid bacillus carriers.

**Multiple Liver Abscesses.** Recovery in cases of multiple liver abscesses is rare. Heinemann<sup>3</sup> reports a man, aged twenty-one years, who, five years previously, suffered with acute osteomyelitis and a year later was operated on for a recurrence with recovery. At the time of admission he had a large liver and was running high fever. Aspiration revealed the presence of an abscess. At transpleural operation an abscess in the dome of the liver the size of a hen's egg was opened. Persistence of temperature from time to time called for repeated aspirations. Over a hundred of these were made, with a result that, in all, 10 small abscesses were opened and drained. The patient eventually recovered.

**Gallstones Demonstrated by the X-rays.** By means of an improvement in technique, Pfahler,<sup>4</sup> the röntgenologist of Philadelphia, reports that he has been able to demonstrate the existence of gallstones in an increasingly large proportion of cases. In his series 33 cases were operated upon. Of this number, stones were found by Pfahler in 20 and by the surgeons in 27. This percentage of positive findings is unusually high according to Pfahler, who believes that one cannot count on more than 50 per cent. in the average run of cases. The improvement in technique consists in inflation of the colon and of the stomach, serial plates being taken from time to time as the inflation is continued and also after change from the supine to the vertical position.

**Reformation of Gallstones after Operation.** Stanton<sup>5</sup> correctly states that if no foreign body is left in the gall-bladder or duct after operation, the reformation of gallstones is so rarely observed as to constitute almost a negligible factor. In his experience, cholecystectomy affords no greater immunity against reformation of calculi than does cholecys-

<sup>1</sup> Deutsch. med. Woch., May, 1914.

<sup>2</sup> Zent. f. Chir., 1914, p. 438.

<sup>3</sup> Berliner klin. Wochenschrift, 1915, No. 51.

<sup>4</sup> Journal of American Medical Association, lxii, p. 1304.

<sup>5</sup> Annals of Surgery, February, 1915, p. 226.



tostomy, and he finds that the two most important factors in attaining success are, the complete removal of the calculi, and the maintenance of sufficiently prolonged postoperative drainage.

**The Cholesterin Content of the Blood in the Diagnosis of Cholelithiasis.** According to Aschoff and Bacmeister, hypercholesterinemia is the fundamental and primary etiologic factor in the formation of gallstones. While the determination of the cholesterin content of the blood is of the utmost importance in studying the effects of dietary and other measures in reducing a hypercholesterinemia, it is not of great value in determining the actual existence of gallstones—the cholesterinemia may have subsided after the formation of the stones which may be giving trouble at the time of observation. After operation, care must be taken to reduce any excessive accumulation of cholesterin in the blood for fear of future formation of gallstones. According to Henes,<sup>1</sup> operation without removal of the gall-bladder does not free the patient from the probability of subsequent stone formation.

The statements of Henes do not tell the entire story. Hypercholesterinemia may be very transient, consequently, unless the clinician is aware of this fact, he may be misled by a single negative report of the hematologist. Cholecystectomy does not assure the patient freedom from reformation of bile sand, although this sequel occurs in a very small proportion of the cases. (The writer has operated on two such cases during the past year. Cholecystectomy had been performed by another surgeon several years before. Recently repeated attacks of typical gallstone colic, accompanied by jaundice and moderate fever, furnished the indication for choledochotomy. The common duct contained clear bile in which cholesterin crystals and a little bile sand were present. There was no obstruction to the passage of the probe through the papilla into the duodenum. In one case there was hypercholesterinemia shortly after operation; in the other, there was none.)

**Gigantic Gallstone.** Campagne<sup>2</sup> tells of the spontaneous passage in the stool of a gallstone weighing 13.22 grams and measuring 34 x 27 x 28 mm. The expulsion was preceded by a number of attacks of colic.

This stone was composed of two originally separate stones which were now joined together by a common cholesterin shell. A surface of one of the stones was concave. It is believed that one stone remained behind which fitted into this facet.

**Biliary Peritonitis.** In the second of Vogel's<sup>3</sup> two cases he found the biliary peritonitis due to a leak through a tiny perforation. He believes that all these cases must be looked upon as microscopical perforations of the biliary system which, on account of their minute size, cannot readily be found, especially at autopsy.

<sup>1</sup> Journal of American Medical Association, lxiii, p. 146.

<sup>2</sup> Lyon Med., 1913, No. 52, p. 1097.

<sup>3</sup> Wiener klin. Woch., 1913, No. 28.

Guibe<sup>1</sup> reports a case in which a carcinoma of the head of the pancreas had pressed on the bile passages. The sterile bile did not seem to irritate, but, when it became infected, set up a fatal peritonitis. Cholecystotomy seems to be the safest way of treating this condition.

**Modification of the Right Rectus Gall-bladder Incision** (McArthur).<sup>2</sup> After incising the anterior sheath of the rectus, blunt cleavage is made from the mid-point of the incision with the handle of the scalpel in such a manner that the upper innervation is carried without rupture upward, and the lower in a like manner downward, thus preserving intact the innervation of the mesial half of the rectus (Fig. 74). The posterior

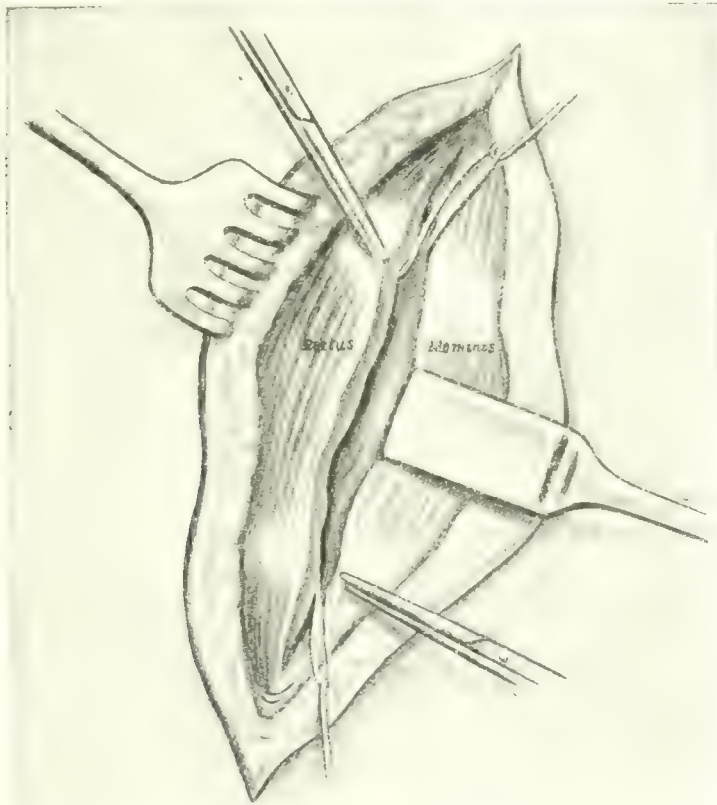


FIG. 74.—Illustrating schematically the first step in the right rectus incision with the innervation to same crowded by blunt dissection to either end of the wound. (McArthur.)

sheath, composed of the tendon and fibers of the transversalis and peritoneum, is now exposed. It is incised parallel with the tendinous fibers of this muscle, *i. e.*, transversely (Fig. 75). To select the proper level for incision, a small opening is made one inch above the free end of the gall-bladder for confirmation of diagnosis by digital exploration. Afterwards the incision can then be enlarged to the median line and as far laterally as seems essential. The operator will be surprised to find that the transversalis (posterior sheath) can, with the gloved

<sup>1</sup> Rev. de Chirurgie, xxxiv, No. 3, p. 233.

<sup>2</sup> Surgery, Gynecology, and Obstetrics, January, 1915, p. 83.

finger, be separated from the internal oblique with ease. Afterwards, when the necessary interference with the gall-bladder has been made and the latter dropped back, the cut portions of the transversalis are seen to lie in contact under absolutely no tension, so that the edges can be whipped together with the greatest ease.

**Butterfly Retractor.** Reder,<sup>1</sup> of St. Louis, has invented this simple instrument which should prove of the greatest use in certain difficult cases in which the assistant's hand or the very largest retractors would have to be used (Figs. 76 and 77).



FIG. 75.—Illustrating the transverse incision of the posterior sheath of the rectus (transversalis muscle and peritoneum) for access to the palpable and distended gall-bladder. It conserves the entire insertion of the transversalis muscle and its respiratory function. With the dropping back of the gall-bladder its separated margins fall back into position and can be easily sutured. (McArthur.)

**Anoci-association in Operations on the Bile Tracts.** Crile<sup>2</sup> reports a case of a man with multiple calculi in the common duct where the biliary field was exposed by modified Wilms' incision, the adhesions between the viscera were gently dissected free by dissection with a sharp knife, the common duct was opened longitudinally under the direct guidance of the eye, the stones removed and the ample incision in the duct was closed by a double row of fine chromic gut sutures on a curved round needle. Bile passed from the very first through the ampulla. The pulse and temperature remained practically the same as before operation. (So-called anoci-association had been employed.)

<sup>1</sup> Surgery, Gynecology, and Obstetrics, February, 1915, p. 224.

<sup>2</sup> Journal of American Medical Association, lxiii, p. 1335.



Crile advocates closure of the common duct in this way in the absence of infection rather than establishing drainage with a fine rubber tube as is at present customary. Regarding the latter procedure, he says, "it has the disadvantage that much bile is lost, cicatricial contraction



FIG. 76.—Retractor with wings folded. (Reder.)

may readily occur from pressure of the tube against the wall of the bile duct and should the drainage tube become occluded there is always the possibility of bile escaping into the peritoneal cavity beyond the field of operation."



FIG. 77.—Retractor with wings spread. (Reder.)

The reader is referred to page 167 of *PROGRESSIVE MEDICINE* for June, 1913, for primary closure of the bile passages in the absence of infection as practiced by Garre and by Rotter. Decubitus of the common duct is due to faulty technique (if it follows the drainage and is

not already present from pressure by stone). If a tube is too large or too stiff, it is not hard to realize how easily a pressure necrosis can be caused by it. The loss of bile for a few weeks is of no moment in the average case. However, if the patient is much run down, the method reported by Schmilinsky (see the next paragraph) is of value.

**Advantages to the System from the Administration of Bile in Cases with Acholia in which a Biliary Fistula is Present.** In 1912, Schmilinsky<sup>1</sup> published two successful cases in which bile from a fistula was collected and fed to the emaciated patient through a stomach tube. There was so much improvement that at the end of two months an operation for closure of the fistula was successfully completed. The writer had occasion to use this method<sup>2</sup> during the past winter with most satisfactory results. A deeply jaundiced, intensely septic man was operated on for a large pericholecystitic abscess and purulent cholangitis. His condition at the time precluded anything more than the establishment of drainage. In the course of six weeks the fever subsided and the bile became clear, but the patient's condition was still very poor; all the bile escaped from the fistula which showed no tendency to close. There was absolute acholia; no jaundice. To improve his condition, the patient's bile was collected by means of a catheter and a small bottle attached to his belt, and was introduced into his stomach by tube at the rate of eight ounces twice a day. Appetite immediately picked up and he improved so rapidly that at the end of a fortnight a common duct stone impacted at the papilla could be removed.

**Transduodenal Choledochotomy for Stone** is an operation which many surgeons of experience rarely feel called upon to perform, inasmuch as they usually manage to accomplish their object without having to resort to this procedure.

Todd<sup>3</sup> reports 6 cases in which the extraction of stone impacted in the papilla of Vater was much more rapidly executed by means of a transduodenal choledochotomy than would have been possible through mobilization of the duodenum by Kocher's method with opening of the common duct in this position. Todd used cigarette gauze drains in all his 9 cases, and, in 2, a duodenal fistula developed, probably due to use of gauze in contact with the suture line. Fortunately, only one of the two had a fatal outcome, the patient dying from starvation at the end of ten days. Todd states that gastro-jejunostomy, with pyloric closure, would probably have saved this patient. I believe even simple jejunostomy combined with Schmilinsky's<sup>4</sup> method of feeding might have tided over matters until the general condition improved enough to justify the larger operation.

<sup>1</sup> Zentralbl. f. Chir., 1912, p. 1667. See PROGRESSIVE MEDICINE, June, 1912, p. 109.

<sup>2</sup> J. C. A. Gerster, Journal of American Medical Association, lxiv, p. 1915.

<sup>3</sup> Annals of Surgery, February, 1915, p. 180.

<sup>4</sup> See PROGRESSIVE MEDICINE, June, 1912, p. 109.

Gosset<sup>1</sup> gives the following indication for duodenotomy in the presence of common duct-stone: (1) Probatory incision in order to feel the papilla; (2) after choledochotomy when concretions cannot be dislodged from the lower segment of the common duct; (3) when, on account of extensive adhesions, the common duct is not easily accessible. Gosset operated six times under the second and third indications. He opens the duodenum by a transverse incision.

Küttner<sup>2</sup> is justly surprised that so many operators find it necessary to utilize Kocher's mobilization of the duodenum or transduodenal choledochotomy in extirpating stones from the common duct. In the vast majority of the cases at his clinic in Breslau, where 75 per cent. of all biliary cases have complications affecting the common duct, the supraduodenal choledochotomy suffices. In certain cases Küttner also uses drainage through the common duct into the duodenum by means of which the patient can be nourished during the first few days.

**Transfusion** continues to be the sovereign remedy for cholemic hemorrhage. Pool<sup>3</sup> has cited a case in which it was necessary to administer three transfusions (380 c.c., 220 c.c., 900 c.c.) before the hemorrhage finally stopped.

The newly introduced method of sodium citrate blood transfusion (Hustin, Lewisohn, Weil), whereby the technique is rendered so simple that introduction of the blood into the donor's veins is no more difficult than giving an intravenous saline infusion, makes transfusion available to any general practitioner who is accustomed to give salvarsan. If, in addition to this, the medical man takes a suitable course of a few days under competent serologists, he can learn how to make the necessary tests for hemolysis and agglutination, and thus place himself in a position where he can safely do transfusion in cases where no blood relatives are available as donors, provided, of course, that said donors are free from syphilitic taint. The making of Wassermann reactions is too complicated to be acquired by anyone outside of a laboratory, as the possible sources of error are too numerous and difficult to detect.

The three-bladed clamp for facilitating vascular suture in establishing an *Eck fistula* described by Peet<sup>4</sup> is almost identical with that of Jeger,<sup>5</sup> which was shown at the German Surgical Congress in 1912.

**Various Means for Repair of Defects of the Common Bile Duct** have been referred to in times past.<sup>6</sup> There is not much to add from the literature during the past year. In this country, Mann<sup>7</sup> used a rubber tube in bridging a defect in the common bile duct; he established a hepaticoduodenostomy. The patient was reported well five months

<sup>1</sup> Journal de Chirurgie, vol. v, No. 5.

<sup>2</sup> Zent. f. Chir., 1914, p. 1439.

<sup>3</sup> Annals of Surgery, December, 1914, p. 768.

<sup>4</sup> Ibid., November, 1914, p. 601.

<sup>5</sup> See PROGRESSIVE MEDICINE, June, 1913, p. 178.

<sup>6</sup> Ibid., p. 172; June, 1914, p. 166.

<sup>7</sup> Surgery, Gynecology, and Obstetrics, March, 1914, p. 326.



after operation; but this is too short a time to speak of a permanent cure.

Abroad, Danies,<sup>1</sup> in experimental work, used a segment of vein instead of the rubber tubing. Tietze used a piece of artery 4 cm. long without success. Noferi<sup>2</sup> used a piece of ureter. Danies<sup>3</sup> also refers to Verhoogen's using a rubber drainage tube. This, however, was not used in the way so prevalent in experimental work at the present time. The end of the tube was led into the duodenal end of the common duct; its course was then backward toward the liver until it reached the other end of the defect; at this point a lateral fenestra was cut and the tube changed its direction and finally reached the surface. The patient was reported in good health a year after operation.

A most ingenious way of solving the problem was recently published by Jackson.<sup>4</sup> He performed pylorectomy (Billroth II) for a carcinoma of the pylorus the size of a small lemon. Being fearful that the terminal portion of the common duct might be occluded by cicatrization in the pancreas, part of which had been resected, choledochotomy was performed and a small rubber drainage tube fastened in place. A persistent biliary fistula remained. Seven months later a second operation took place. The biliary sinus was found to originate at the upper border of the pancreas. All efforts to probe through the terminal part of the common bile duct were unavailable, and it seemed best to attempt to reconstruct the necessary part of the common duct after the method of Sullivan. (Wilms.) The common duct was cut squarely across where it impinged on the fistulous opening. With its division there was an almost visible retraction of the proximal portion of the duct. It was found that at least two or three inches of artificial duct would have to be constructed. It seemed more feasible to bring up the jejunum in front of the transverse colon and to attach the stump of the common duct to it. This was accordingly done by fastening a small-caliber, soft-rubber tube into the duct by a linen stitch, inserting the distal end of the tube through a small opening in the wall of the jejunum and infolding the tube and as much of the duct as possible without tension about one-half inch. The lateral surfaces of jejunum were then abraded and fastened to the adjacent surfaces of the liver and pancreas by a supporting stitch. The patient made an uneventful convalescence and remained well until six months after the last operation, when he had a sudden profuse hematemesis followed by moderate jaundice. This cleared up and he is well nine months after operation.

**Resection of the Duodenum for Carcinoma of the Papilla.** Hirschel<sup>5</sup> found the gall-bladder filled with pus and stones. The choledochus

<sup>1</sup> Bull. de l'Acad. roy. de méd. de belg., 1914, No. 3, p. 201.

<sup>2</sup> Stropeni and Giordano, Zentralbl. f. Chir., 1914, p. 190.

<sup>3</sup> Zentralbl. für Chirurgie, 1908, p. 790.

<sup>4</sup> Surgery, Gynecology, and Obstetrics, August, 1914, p. 232.

<sup>5</sup> Münch. med. Woch., 1914, No. 31.

was distended with pus. A carcinoma of the papilla the size of a walnut completely obstructed the common duct and was adherent to the pancreas. After mobilizing the duodenum, which was relatively easy, the adjacent portions of the common bile duct, head of the pancreas, and duodenum were resected. The suture of the duodenum was not particularly difficult. Neither was the suture of the duct of Wirsung into the duodenum. The defect in the common duct was made good by introduction of a drainage tube which joined the stump of the common duct with the lumen of the duodenum. These procedures narrowed the duodenum so that a gastro-enterostomy was necessary. Drainage. During the first day a little bile and pancreatic secretion escaped. Following this smooth recovery, the patient died a year later. Cause of death unknown.

### PANCREAS.

**Postoperative Necrosis of the Pancreas.** Jenckel<sup>1</sup> reports 2 cases of this complication. One occurred after removal of a carcinoma of the sigmoid in a man, aged fifty-six years, the other, after removal of a large ovarian cyst from a woman, aged sixty-four years. There was nothing in their histories suggestive of previous pancreatic trouble.

The necrosis developed soon after the operation and proved fatal on the sixth and sixteenth days respectively.

**Pancreatitis following Mumps.**<sup>2</sup> Out of 300 cases in an epidemic of mumps, in 3 there were symptoms suggesting acute pancreatitis. Each of these patients developed vomiting suggesting ileus, fever, with delirium and collapse, pain and tenderness above the umbilicus, intense acetoneuria and Cheyne-Stokes breathing, in two the pulse was very slow. Recovery was complete about ten days after the first symptoms of the mumps.

**Injury to the Pancreas in the Course of Gastric Resections,** as observed by Küttner with a consequently increased mortality, is discussed in the pages devoted to the surgery of the stomach.

### SPLEEN.

**Splenectomy for Various Blood Conditions.** The consensus of opinion during the past year is well expressed by Klemperer,<sup>3</sup> who states that splenectomy only allows of an improvement in pernicious anemia but effects a cure in Banti's disease, tuberculosis of the spleen, and hemolytic icterus.

Ranzi, of Vienna, at the International Surgical Congress which met in New York last spring reported 20 splenectomies from the clinic of

<sup>1</sup> Arch. klin. Chir., cv, No. 1. Journal of American Medical Association, lxiii, p. 712.

<sup>2</sup> Drazinski and Mehlmann, Deutsch. med. Woch., 1914.

<sup>3</sup> Therapy der Gegenwart, 1914, Heft 1. Zent. f. Chir., 1914, p. 788.

von Eiselsberg for the following conditions: Hemolytic icterus (3 cases), pernicious anemia (5 cases), Banti's disease, and hypertrophic cirrhosis of the liver (9 cases), thrombophlebitic forms (3 cases). Of the 20, 4 died immediately following operation (shock, ileus, pneumonia); the immediate results in the other 16 cases were very satisfactory. Ranzi reports that most of the operations were done under local anesthesia with light ether narcosis at critical times. He favors incision with a median laparotomy wound in which, if necessary, more space could be gained, by a transverse incision to the left at the lower angle.<sup>1</sup>

**THERAPEUTIC TESTS.** In pernicious anemia, Klemperer recommends a therapeutic test for syphilis, even if the Wassermann is negative. In hemolytic icterus he states that one often sees spontaneous remissions of the disease and consequently there should be no hurry in deciding for splenectomy under such conditions. Turk recommends anti-specific treatment in cases of hemolytic icterus, in which the etiology is not definitely known.

Ottenberg and Libman<sup>2</sup> believe that SPLENECTOMY IN PERNICIOUS ANEMIA has about the same effect as transfusion. It should be reserved as a final method of producing remission when transfusion will no longer do so.

**CASES OF PERNICIOUS ANEMIA IN WHICH SPLENECTOMY DID NOT AFFORD RELIEF.** Guleke<sup>3</sup> had 2 cases of splenectomy for pernicious anemia. Both patients stood the operation surprisingly well. Immediately afterwards recent forms of erythrocytes appeared in the blood and the hemoglobin rose. In both cases at the end of two weeks there was a sudden blood crisis with complete absence of young forms of erythrocytes. Within thirty-six hours one patient died. The other died after seven days, in spite of repeated transfusions.

Other cases in which pernicious anemia was not improved by splenectomy are reported by Huber<sup>4</sup> and Oppenheim.<sup>5</sup>

Cases of pernicious anemia doing well for from three months to one year after splenectomy are reported by Mühsam<sup>6</sup> (1 case), Port<sup>7</sup> (1 case), Jagic<sup>8</sup> (3 cases), Dahl<sup>9</sup> (1 case), Finney<sup>10</sup> (2 cases).

**Hemolytic Icterus.** Graf<sup>11</sup> reports a case of a family with thirteen living children in which the father and six of the seven younger children presented the typical syndrome of hemolytic icterus. Two girls, who seemed most seriously affected, derived great benefit from splenectomy.

<sup>1</sup> See PROGRESSIVE MEDICINE, June, 1914, p. 175.

<sup>2</sup> Journal of American Medical Association, lxiv, p. 613.

<sup>3</sup> Verhandl. d. Deutsch. Ges. f. Chir., 1914.

<sup>4</sup> Zent. f. Chir., 1914, p. 427.

<sup>5</sup> Ibid.

<sup>6</sup> Deutsch. Gesellsch. f. Chir., 1914.

<sup>7</sup> Berliner klin. Woch., March 16, 1914.

<sup>8</sup> Wiener. klin. Woch., November 26, 1914. No. 48.

<sup>9</sup> Hygiea, 1914, Band lxxvi, Heft 8.

<sup>10</sup> Surgery, Gynecology, and Obstetrics, 1914.

<sup>11</sup> Deutsch. Zeit. f. Chir., cxxx, Nos. 5 and 6.



Another patient, a man, aged thirty-eight years, with typical hemolytic jaundice also was greatly improved by splenectomy. One patient, a girl, aged twelve years, developed marked polycythemia after splenectomy, the reds numbering now almost seven millions.

**Etiology of Splenic Anemia or Banti's Disease.** Yates, Bunting, and Kristjanson<sup>1</sup> report obtaining pure cultures of diphtheroid organisms apparently identical with, or closely related to, the bacilli Hodgkini from two spleens removed in the treatment of splenic anemia. Inoculation of dogs and rabbits with the organism from the second case, and with a culture obtained from the lymph glands of a case of Hodgkin's disease, were followed by changes which were characteristic of the disease as described by Banti. They consider these findings significant in view of the result of A. G. Gibbon,<sup>2</sup> who found in stained section of 6 cases of splenomegaly, a Gram staining streptotrichal organisms at times segmented and at times appearing bacillary form.

One must be a trifle conservative in accepting this statement, inasmuch as the Bacterium Hodgkini has not so far been confirmed as the causative factor in Hodgkin's disease.

**Ligature of the Splenic Artery as a Substitute for Splenectomy.** Lanz's<sup>3</sup> patient was a young man, aged twenty-four years, who, for more than six months, had pains in the left lower abdomen. He had been under treatment in a hospital for four and a half months for retention of urine. There was severe pain, both on urination and defecation. Examination revealed a tumor the size of a fist in the left hypogastrium. It was slightly tender, rounded, of even consistency with a smooth surface. *Per rectum* it was found to lie to the left of the promontory and sank into the true pelvis upon emptying the bladder by catheter. There was a residual urine of 50 c.c. The cystoscopy examination revealed nothing abnormal.

The abdomen was opened through a left rectus incision, exposing a wandering spleen fixed to the posterior bladder wall. Exploration of the left hypochondrium revealed absence of the spleen there, and a left kidney of normal size in its proper place. On account of the extensive adhesions around this abnormally fixed spleen, ligation of the vessels was considered. Rather than to ligate all of these (for fear of extensive necrosis of the organ), it was determined to simply ligate the splenic artery. This was done, together with extirpation of a small accessory spleen which lay at the hilus. Convalescence was uninterrupted. Upon examination six months later, the patient stated that he was absolutely free from any complaint; bimanual examination of the pelvis failed to reveal any trace of the tumor.

Lanz suggest that in those cases of pernicious anemia in which

<sup>1</sup> Journal of American Medical Association, lxiii, p. 2225.

<sup>2</sup> Quarterly Journal of Medicine, January, 1914, p. 153.

<sup>3</sup> Zent. f. Chir., 1914, p. 228.

splenectomy is indicated, but where the mechanical considerations render this difficult, a simple ligature of the splenic artery may suffice.

**Late Finding after Splenectomy for Rupture of the Spleen.** Küttner<sup>1</sup> cited the case of a patient operated on seven years before for a bullet-wound of the abdomen. Among other injuries there was rupture of the spleen (the lead bullet was 11 millimetres caliber and flattened out). This injury to the spleen required its removal. A few years later the patient died of coronary artery disease. At autopsy, 80 to 100 true small spleens were found in the peritoneal cavity. These spleens were not present at the time of operation.

<sup>1</sup> Berlin. Ges. f. Chir., January 12, 1914.

# GYNECOLOGY.

By JOHN G. CLARK, M.D.

## CANCER OF THE UTERUS.

**Radiotherapy.** The past year has been productive of nothing that can be considered in any way epoch making in the field of gynecology. Radiotherapy continues to hold the centre of interest, at least so far as the Continental literature is concerned, and is gradually beginning to arouse attention in this country, but the general tendency of late has been rather toward a recognition of its limitations and shortcomings than to a further outburst of more or less unreasoning enthusiasm, such as swept over the world a year or so ago. The place of radium and the  $x$ -rays in the treatment of benign affections of the female genital organs, especially the uterus, may be considered a fairly settled question in Europe, but in the realm of malignant disease the proposition is quite different; here the views of the most experienced are at times at marked variance, and all feel that they are still groping and experimenting. The chief advances in this field really consist of increased accuracy of technique, increasing knowledge of the indications and contra-indications, and a better realization of the limitations of this type of therapy, which is gradually developing as the result of more extensive experience.

To judge from the German and other Continental literature of the first half of 1914—for since then there has been but little of moment—the chief activities of the gynecological clinics have been directed along these lines, and the reports of results attained, or believed to be attained, are legion. Adhering to our principle of former years in culling out this mass of material, however, we have selected chiefly the work of men whose attainments in the older gynecology give them a certain weight of authority, and the opportunity to judge with something like a proper perspective of the comparative value of operative and non-operative forms of treatment. In this way, we have followed the work of several of the men whose earlier impressions of radiotherapy we recorded last year, and can thus see in what respect their hopes have so far been fulfilled or disappointed. It is interesting to note, in contrast to this flood of material upon radiotherapy that has recently swept through the literature, how completely the discussion of radical operative measures, of the Wertheim type, have disappeared, although



it is but two or three years ago that nearly the whole of our attention was centered upon this topic, so far as cancer of the uterus was concerned. Truly, there are fads and fancies in medicine, as in everything else!

**RADIUM *versus* THE X-RAYS.** Throughout much of the literature upon radiotherapy considerable discussion will be found upon the relative value of the  $x$ -rays and the radio-active salts, such as radium and mesothorium, some men advocating the former, some the latter source of radiant energy, while others combine them, and claim to obtain the best results in this way. Owing to the enormous cost of the radium preparations, it is naturally of great practical interest to determine to what degree their action upon malignant tissue can be paralleled by the  $x$ -rays, both with regard to penetrability and destructive effect. This problem, upon which we have touched in previous years, has led to the expression of marked differences of opinion among physicists and Röntgenographers, the more generally accepted opinion being that for practical purposes at least, it is not possible to produce with the  $x$ -ray tube emanations which are as efficient as the gamma rays of radium. Somewhat different views are expressed, however, by Dessauer,<sup>1</sup> an engineer connected with the Veifa Instrument Company, as the result of very extensive and complex experiments carried out in their laboratories. He claims that it is technically possible to produce with the Röntgen-tube rays which have the efficiency of at least the softer gamma radiations of the radioactive substances, these rays possessing from ten to fifteen times more penetrating power than the ordinary so-called "hard" rays in general use.

In the course of these investigations, Dessauer has found that the emanations from the tube are composed of a complex mixture of very unlike elements, and that the proportion in which components of varying degrees of penetrating power are present in this "Röntgen spectrum," as he calls it, depends not so much on the hardness of the tube as on the manner of its use. Thus, what he terms *ultra-penetrating* rays may be obtained under suitable conditions from tubes which are not to be classed as extremely hard, and the quantity of these rays is such that a tube working under these conditions is delivering radiations equal in value to several *grams* of radium, an amount greater than at present is ever available for therapeutics, and this even though these rays comprise only a few parts per thousand of the total radiant output of the tube. It is thus only necessary, by means of suitable filters, to eliminate all the other elements of the mixture to have at one's disposal what Dessauer claims amounts to an artificial radium preparation of gigantic potency.

Further investigations showed that these radium-like Röntgen

<sup>1</sup> Münch. med. Woch., 1914, lxi, p. 989.

rays undergo absorption at a fairly steady rate of about 5 to 10 per cent. for each centimeter of tissue penetrated, from which it is easy to compute with a fair degree of exactitude the dose actually being administered to any given region. With these various improvements in technique, the author believes the time is near when for all purposes except application within body cavities, such as vagina, uterus, rectum, actual radium preparations will be replaced by the *x*-rays.

If this be indeed true, efficient radiotherapy will in the future be placed at the disposal of many from whom the benefits of radium would necessarily be excluded because of the cost. It must be remembered, however, that the results upon which Dessauer's claims are based were obtained by a highly trained electrical engineer, working with the highest type of apparatus, under the best possible conditions, and that, moreover, being in the employ of one of the principal firms engaged in the manufacture of Röntgen apparatus, he may be quite justifiably a little biased in his views. It remains to be seen whether rays of the great efficiency and penetrating power described can be evolved from apparatus subjected to the wear and tear of the average hospital before we can consider radium practically superceded.

EXPERIMENTAL STUDIES OF TISSUE CHANGES FOLLOWING EXPOSURE TO RADIANT ENERGY. In order to discover, if possible, an explanation for some of the empirically known facts with regard to the effect of radiant energy upon healthy and malignant tissue, and to determine in what manner the destructive effect, especially upon the latter, is brought about, Wassermann<sup>1</sup> has carried out some extremely interesting experiments. His first problem was to determine whether the rays act *directly* upon the carcinoma cells themselves, or through intermediaries, such as the blood, lymph, etc. For this purpose it was necessary to bring the rays in contact with cancer cells unmixed with any other tissue, conditions that could only be obtained *in vitro*. Numerous experiments with a very virulent strain of mouse cancer, which upon inoculation produced growths in practically 100 per cent. of cases, showed that tiny pieces of this tissue could be kept at blood temperature in Ringer's solution for several hours without losing their vitality. After this was determined, bits of the cancer tissue, chopped so fine as practically to form an emulsion in the Ringer solution, were placed in three test tubes. No. 1 was used as a control; in No. 3 was hung a silver and brass capsule containing 55 mg. of mesothorium, and in No. 2 was hung a similar capsule, but containing no radio-active salt, to test the effect produced by mere contact of the metal with the cancer cells. At given intervals three mice were inoculated, one from the contents of each tube. It was found that while the tissue from tubes 1 and 2 maintained for many hours their power to produce growths, that from

<sup>1</sup> Deut. med. Woch., 1914, xl, p. 524.



tube 3 soon became inert. It was thus demonstrated that radioactive substances act *directly* upon the cells which they destroy, and are not dependent upon intermediary agencies. When slightly larger bits of tissue were used in the experiments, however, thus forcing the rays to pass through an appreciable amount of tissue in order to reach the most centrally located cells, very much less effect was produced in the way of rendering them inert.

A second question then presented itself, namely, in what manner does this destructive effect take place? Two possibilities were to be considered: either that the rays actually kill the cells outright, or that the cells themselves remain alive, but lose some attribute which previously gave them the quality of *malignancy*. Some years ago Neisser discovered that if an emulsion of living cells is mixed with a very weak methylene blue solution, and the surface covered with liquid paraffin to exclude air, the cells will use up sufficient oxygen in their metabolic processes to reduce the methylene blue and render the solution colorless, whereas if the cells are dead no such action takes place. Wassermann found in applying this test that bits of tissue taken from a tube after exposure to mesothorium would show the reduction, whereas other bits of tissue from the same tube taken at the same time, and injected into animals failed to produce growths. It was evident, therefore, that these cells were *still living, but had lost their malignancy*, whence the conclusion is obvious that radiant energy, although destroying the reproductive power of cancer cells, does not actually kill the original cells themselves. Cancer tissue whose elements have thus lost their reproductive power soon becomes innocuous, however, and eventually disappears, for the old generations of cells die off, or are destroyed by the natural resistant powers of the body, and no new ones are formed to take their place and continue the growth. Thus is explained, Wassermann thinks, the well known fact that, in a general way, the more actively proliferating is a tissue, the more sensitive is it to the destructive action of radiant energy; it also explains the marked effect of this upon the sexual glands, for in tissues of this type proliferation is going on rapidly, and the failure of any given generation of cells to reproduce is more quickly noticed than in tissues in a more quiescent state, where replacement of the elements is taking place much more slowly.

CLINICAL REPORTS ON THE TREATMENT OF MALIGNANT DISEASE OF THE UTERUS BY RADIOTHERAPY. *Work at Bumm's Clinic in Berlin.* Bumm,<sup>1</sup> although declaring himself a believer in the future of radiotherapy, is by no means carried away by enthusiasm, and in a paper presented before the Berlin Medical Society at a symposium on the subject brings out with unusual clearness the limitations of the method. In view of the unbridled optimism with which the lay press has in the

<sup>1</sup> Berl. klin. Woch., 1914, li, p. 193.



past couple of years seized upon this subject, the opening paragraph of Bumm's address is most timely, and coming as it does from one who has had large experience, seems worthy of quotation in full. "Recently," he says, "there has been almost more discussion of the radium and mesothorium treatment for cancer in the lay than in the medical press. If one were to depend for information entirely upon the newspapers, it might easily be supposed, in view of the enormous sums being spent on all sides for the purchase of radioactive substances, that the positive cure of all cancer is merely a matter of getting enough of these wonderful chemicals. Truth unfortunately compels us to admit, however, that in reality we are far indeed from having arrived at this situation; the imagination of the journalists has in this respect far outstripped the facts, and for the present we must confine ourselves chiefly to the task of investigating quietly and with an unprejudiced mind what has actually been accomplished."

Bumm reports that he has used radiotherapy in 108 cases of uterine cancer for a sufficient length of time to produce some result. In every one of these patients an apparent *local* cure was effected within three to five weeks—by that he means that, following a period of irritation, with increase in the size of the mass, there has been shrinkage, disappearance of friable tissue, drying up of ulcerating surfaces, and gradual formation of a dense, firm scar, representing the site of the former cancerous growth. On microscopic examination, such areas show either dense masses of fibrous tissue in a high degree of hyaline degeneration, with no trace of malignancy, or else here and there are found small, almost indistinguishable clumps of cells which once represented cancer nests. This local action of radium is indeed, the author thinks, something marvelous; it has hardly been exaggerated in the reports, and is far in advance of that produced by any other means at our command. Unfortunately, however, local tissue destruction is only a part of the work to be accomplished in the treatment of cancer; if permanent results are to be obtained, deep seated metastases must also be attacked, and this without destroying the intervening healthy tissue.

While the effects of long continued, intensive radiation are shown more rapidly by cancer cells than by those of normal muscle or connective tissue, Bumm lays stress on the fact that the latter also are just as surely affected to a certain degree, although evidences of this may not appear till months after treatment has been stopped. The principal change induced in normal tissue is a widespread hyaline degeneration, by reason of which the tissue loses markedly in vitality. The resulting indurated scar-mass often leads to strictures and perforations of hollow viscera, with most distressing consequences. This hyaline degeneration is due chiefly, Bumm believes, to secondary radiations arising from the capsule in which the radium or mesothorium is contained, and experience has shown that these radiations are greatest when the capsule is

of lead, wherefore this material has been abandoned entirely in favor of other metals.

Among the whole 108 cases treated, 40 would have been classed as operable, the others as hopeless. So far only 15 have shown signs of recurrence, but the apparent excellence of this showing is greatly reduced when we consider that at least two-thirds of them have been under observation for less than six months, so that as yet practically nothing can be said from actual experience as to the permanency of results. When recurrence did take place, it was always in the deeper tissues beneath the scar resulting from the radiation, and was evidently due to continued proliferation of undestroyed cancer elements in this region. If further attempts were made to reach these by intensive radiation, extensive necrosis occurred in the areas previously healed.

In order to determine to what extent radiotherapy can be depended upon to destroy the more deeply seated foci of a cancer, Bumm has studied very carefully a number of specimens obtained at operation or autopsy after thorough radiation, with some extremely interesting results, from which he is able to draw conclusions of importance concerning the entire subject of cancer destruction by radiant energy. The first case was a woman, aged fifty-two years, with an inoperable cervical cancer extending far out into the right parametrium. She was given within four weeks a total exposure of 48,670 milligram-hours of mesothorium, following which a typical local cure was obtained. She died suddenly from a pulmonary embolus arising from a thrombus in the right femoral vein, and at autopsy the following conditions were found: The cervical region of the uterus was composed of dense fibrous tissue, in which microscopically a few small groups of cancer cells were found, all badly damaged, and in evident process of degeneration; there was also a small cancerous focus in the right parametrium, containing a degenerated centre, but with actively proliferating cells on the periphery (Fig. 78).

A second case, an inoperable cancer of the cervix, with involvement of each parametrium and the posterior vaginal vault, was treated with an exposure of 38,240 milligram-hours of mesothorium in the course of three months. The patient, however, gradually lost strength and died. At autopsy, a dense scar was found in the cervical region, with a recto-vaginal fistula the size of a 25-cent piece in the posterior fornix. In this instance, there was no trace of cancer in the cervical tissue, but one lymph node in the parametrium, and several iliac nodes, showed active metastatic invasion (Fig. 79).

In a third case, a patient, aged fifty years, was suffering from an inoperable cancer of the cervix, with large ulcerating crater, bilateral infiltration of the parametria, and marked cachexia. Treatment was given here both with mesothorium and the x-rays, a dosage of 738-X of the latter and 14,660 milligram-hours of the former being adminis-

tered in forty-eight days. This was followed by rapid healing of the carcinomatous crater, with cessation of hemorrhage and discharge; the parametrial infiltration likewise disappeared with the exception of one nodule on the left side, which persisted, hence operation was

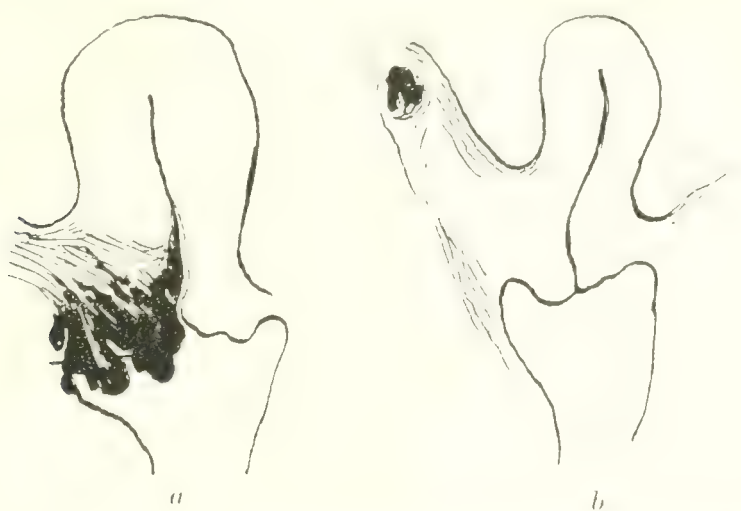


FIG. 78.—*a*, condition at beginning of treatment; *b*, specimen after removal (carcinoma black).

resorted to. Nothing suggestive of cancer could be seen grossly in the extirpated uterus, but on microscopic examination two very minute foci were found in the cervical wall; the cells of these were in part degenerated, but in part appeared living and active. There was also

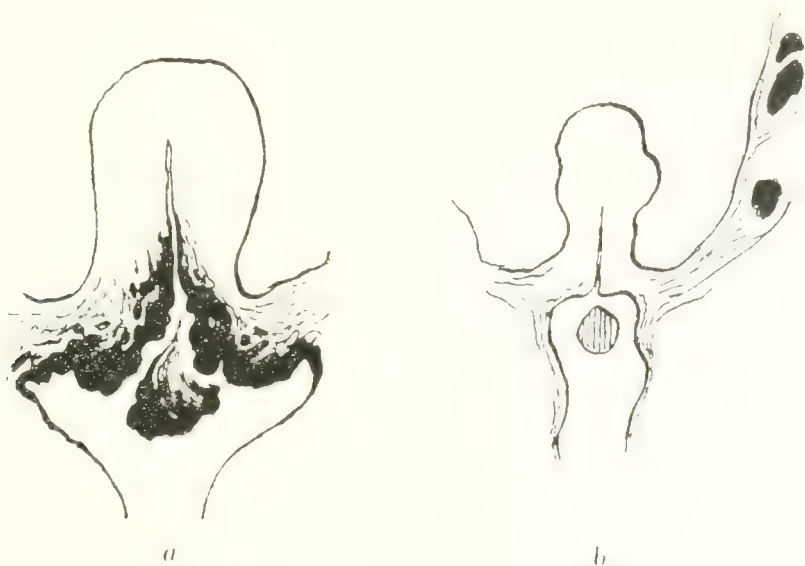


FIG. 79.—*a*, condition at beginning of treatment; *b*, specimen subsequently removed.

a small focus in the parametrium, and the nodule proved to be a carcinomatous lymph node (Fig. 80). Two other very similar cases were studied, with almost identical findings in the extirpated uteri.

It is evident that so far as these cases are concerned, in no single



instance was every last trace of carcinoma obliterated, although in some the only remaining malignant cells appeared to have been greatly damaged. It further appears that practically all cancer tissue lying within 3 to 3½ cm. of the surface can be definitely destroyed by mesothorium; beyond that depth, however, its action is very uncertain, and carcinomatous nodes lying at a depth of 5 cm. or more remain practically uninfluenced.

*Technique.* Bumm thinks that the dictum of "the larger the quantity of radium or mesothorium used, the better the results," has been carried too far of late, and that there is great danger of serious injury to normal tissues in using larger amounts than 200 mg. of either of these

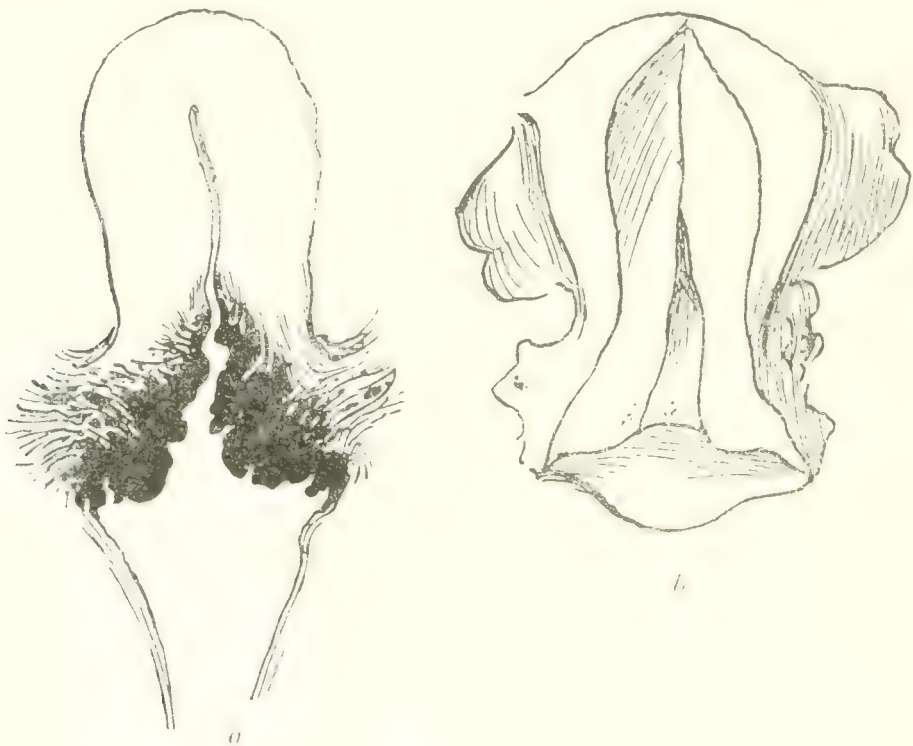


FIG. 80.—*a*, condition before treatment; *b*, uterus removed and cut open, after forty-eight days' treatment.

substances. As a routine he himself does not now use over 50 to 100 mg. The time of exposure is of course governed in large part by the amount of material used; 200 mg. should in his opinion never be allowed to act for more than a very few hours, whereas more moderate doses (50 to 100 mg.) may be left in place for 6 to 12 hours if careful watch is kept of the local and general reaction. For filtration, Bumm is now using a capsule either of 3 mm. of aluminum or 1.5 mm. of brass, covered with a sheet of metal-free rubber 2 mm. thick to absorb the secondary rays. The whole is wrapped in cotton to keep it at some distance from the vaginal mucosa, as in this way superficial burns are largely avoided.

*In conclusion,* Bumm says he is still a firm believer in *x*-ray treatment for cancer, and now uses it in conjunction with mesothorium in prac-

tically all cases; he thinks that much less destruction is caused by it than by the radio-active salts, and has come to employ the latter chiefly for their local action on the primary growth, depending on the  $x$ -rays for destruction of all deeper foci.

In a somewhat later paper, Bumm and his assistant Warnekros<sup>1</sup> come out much more positively still in favor of the  $x$ -rays as compared to radium or mesothorium in the treatment of deep seated carcinomas, on account of its far greater penetrating power. Whereas the effective range of the latter substances is limited to about 3 cm. beneath the surface, as was brought out in the preceding paper, the enormously greater power of the  $x$ -ray tube permits it to be placed at a considerable distance from the skin, thus largely eliminating the burning rays, and yet it will deliver in the depths a dosage of radiant energy far in excess of that from the largest quantities of radium available. Numerous very elaborate experiments for testing the dosage actually obtained at various depths were carried out by the authors, as a result of which they have estimated that no less than 75 *grams* of radium, applied directly to the skin, would be necessary to deliver in a given unit of time the same dose of energy at a depth of 12 cm. that would be delivered by a suitable Röntgen tube placed at a distance of 22 cm. from the skin surface.

From their experiments, Bumm and Warnekros estimate that an average Röntgen dose of 300 to 500-X is necessary to destroy superficial cancers directly exposed to attack. In order to exterminate deep seated growths, therefore, it is necessary to deliver at least this amount of energy to the point at which they are situated. The limit of applicability of the  $x$ -rays for this purpose appears so far to be a depth of about 10 cm.; in passing through this amount of tissue, the rays are reduced to about  $\frac{1}{7}$  their surface power, so that in order to deliver a dose of 500-X to a tumor at this depth, 3500-X would have to be applied to the surface, a feat which is possible only by the use of the hardest tubes, a long tube-skin distance, and many portals of entry. By these means, however, it actually is possible, and thus growths situated anywhere up to this depth are brought within the range of attack. To prove this, Bumm and Warnekros took six women suffering from advanced carcinoma of the cervix, in all of whom large fungoid, freely bleeding masses completely filled the vaginal vault, and subjected them solely to radiation from the abdomen or back. In all six cases the tumor completely disappeared in a few weeks, and excisions of tissue for microscopic examination showed almost complete destruction of the carcinoma cells, only a few scattered, degenerating remains of these being found, surrounded by dense masses of fibrous tissue, and, in one instance, no cancer cells were found at all.

As a result of these investigations, Bumm believes the way is opened

<sup>1</sup> Munch. med. Woch., 1914, lxi, p. 1601.

up for the treatment of many of the heretofore supposedly inaccessible deep seated growths, but the technique must be very carefully carried out, and is both time absorbing and costly, a fact which must be recognized by doctor and patient. In certain regions, of course, the administration of such massive  $x$ -ray doses is impossible, because of injury which would be caused to important organs, such as the stomach, heart, intestines, etc.; in many instances considerable irritation of the skin is bound to result, even going on to vesiculation, but this condition always heals readily in a few weeks under local treatment, and is really a small price to pay, in Bumm's opinion, for the cure of an otherwise hopeless malignant growth.

*Reports from Freiburg.* Krönig,<sup>1</sup> on the other hand, says that he cannot agree with this idea of the penetrability of the gamma rays of radium being limited to only about 3 cm. of tissue, since he has a series of 24 cancer cases that have been free from all recurrence for periods of one to three years, among them being several mammary tumors, in which the distinctly palpable growth extended deeper than 3 cm., and a tongue cancer which had to be reached through the jaw, from a much greater distance than this. To prove the point more thoroughly still, he treated a number of cervical and vaginal cancers with radium applied to the abdominal wall, and while these are as yet of too recent date to permit of a definite judgment as to results, in one instance a large cauliflower growth of the cervix completely disappeared, and in others, numerous excised bits of tissue showed the most extensive retrogressive changes in the carcinoma cells.

Krönig therefore does not agree with Bumm and Warnekros that  $x$ -rays possess a greater penetrating power than do the emanations of radium or mesothorium. He does not wish to be misunderstood, however, as meaning that the latter are necessarily *better* for the treatment of deep seated carcinomata than are the  $x$ -rays, for he thinks the actions of these different substances depend on something more than mere penetrability. He believes that they possess a distinctly different *biologic* action, and that just because in some instances apparently similar effects are produced, such as amenorrhea, or the destruction of cancer tissue, we cannot assume that the mode of action has been the same, or that the differences are only quantitative. In support of this supposition, Krönig says he has observed that in some myoma and carcinoma cases the action of  $x$ -rays is very different from that of radium, and as a result of three years' observation of a large number of carcinomas treated with both kinds of radiant energy, he has come to agree with some of the French scientists, who speak of radium-sensitive and Röntgen-sensitive tumors on the one hand, and of radium-fast and Röntgen-fast ones on the other. It seems that some growths

<sup>1</sup> Munch. med. Woch., 1914, lxi, p. 1715.



that are refractory to large doses of one kind of rays will yield readily to comparatively mild doses of the other. Both kinds of treatment have their place, therefore, and it cannot be said that one should be adopted to the exclusion of the other.

This sounds all very well, but a little light is thrown on the extremely unsettled condition of the whole subject when we come on the following almost diametrically opposite expression of opinion in a paper published in another journal by Krönig<sup>1</sup> in conjunction with five of his assistants: "Histological examinations have shown that no important difference exists between the biologic action of Röntgen rays and mesothorium emanations upon carcinoma." In this paper the authors reiterate, however, that they have found it possible with mesothorium to produce complete retrogression of deep seated carcinomas, without injuring the superficial tissues, but that for this purpose the capsule must be placed at least 5 cm. from the skin. Most cases of burns occurring in spite of filtration are due, they think, not to secondary rays from the metal capsule, as has been generally supposed, but to too close application of the capsule to the skin. In order to avoid the danger of merely stimulating the malignant tissue to increased growth by too small doses, however, they have found it necessary, when working with mesothorium at this distance, to employ an amount equal in activity to at least 500 mg. of radium bromide. They now claim to have cases treated in this manner in which an apparent cure has been maintained for two years, but admit that a final judgment upon the method cannot be passed until the patients have been under control for at least five years.

In a couple of papers published during the past year in American journals, Krönig<sup>2</sup> has brought directly before the profession in this country some of his ideas upon the use of radiotherapy versus operation in the treatment of both benign and malignant conditions of interest to the gynecologist and abdominal surgeon. While these articles contain practically nothing new, or that has not already been discussed here, it is of interest to note that they take a distinctly more conservative tone than most of Krönig's writings that have appeared in his native land, most of which have been tinged with an almost unbounded optimism; and a short summary of the present status of his opinion with regard to the value of radiotherapy in the treatment of cancer, given in one of these papers, is of interest as revealing the latest views of this enthusiast—at least as prepared for American consumption.

Krönig admits that he has not succeeded in curing a single case of carcinoma in which metastases had occurred. While in many of these

<sup>1</sup> Deut. med. Woch., 1914, xl, pp. 740, 793.

<sup>2</sup> American Journal of Obstetrics, 1914, lxix, p. 204; Surgery, Gynecology, and Obstetrics, 1914, xviii, p. 529.

cases there were remarkable retrogressions, and the growths appeared temporarily checked by the intensive action of *x*-rays and radium, it cannot be said that a single patient has been saved. A second group of cases comprises those in which the new-growth had extended beyond the primary focus into adjacent tissues—as, for example, into the parametrium and contiguous glands from the cervix—but had not as yet formed metastases in distant organs. It must be admitted, Krönig says, that the majority of these likewise cannot be cured in spite of the most intense radiation; in a few instances, however, complete retrogression of the tumor has apparently taken place, with no evidence of recurrence for periods of up to a year or slightly more. Whether or not these results will be permanent, of course only the future can show. The best results have been obtained in a third class of patients, in whom the carcinoma had not advanced beyond the primary focus; in other words, early cases, which would be classed as operable. In conclusion, the author says that “We must not expect too much of Röntgen and mesothorium treatment in malignant tumors. If, however, a relatively large percentage of operable cases remain permanently cured, the success of the treatment would still be sufficiently great, for we know that in operations for carcinoma in the genital organs we find a high mortality rate. . . . Should we really succeed in avoiding these operations, we should, in my opinion, have achieved a great work.”

*Döderlein's Experiences.* About two years ago<sup>1</sup> the first report from the Munich Gynecological Clinic upon radiotherapy appeared. At that time Döderlein, the director of the clinic, had had more experience with the *x*-rays than with radium or mesothorium, and was able to report only about a half dozen cases in which the latter had been employed. Since that time, however, his experience with it has greatly increased, and in a second paper, published in conjunction with one of his assistants, Döderlein<sup>2</sup> is able to review a much larger number of cases. He says that during the past year the number of uterine cancer patients applying at the clinic increased enormously, owing to the gradual spread of the knowledge that this new form of treatment was being applied there, and that with this increase in the number of cases, there was a more than proportionate increase in their severity. Thus, whereas in previous years about 50 or 60 women suffering with uterine cancer had applied annually for treatment, nearly 70 per cent. of these being operable, in the last year no less than 153 such cases had applied, but only about a third of them in an operable state. He insists, therefore, that in forming a judgment of the results obtained with mesothorium, this high proportion of advanced cases must be kept in mind, since no patient was excluded from treatment, no matter how utterly hopeless her condition appeared.

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1914, p. 185.

<sup>2</sup> Münch. med. Woch., 1914, lxi, pp. 226, 313.



Of the 153 cases of uterine cancer that were observed during the year, 24 died; these were all in advanced stages, and death seemed in nowise attributable to the influence of the radiotherapy. In 31 patients, neither objective or subjective signs of the disease were present at the time of writing; these women felt entirely well, had no bleeding, pain, or discharge, and on combined examination nothing suggestive of carcinoma was to be found. In some, a well-formed cervix with smooth surface, had replaced the former carcinomatous crater; in others, however, varying amounts of contraction and sclerosis of the vaginal walls were present, with in some instances adhesions between the walls. Nineteen of these cases were not far advanced, and would have been classed as operable, but the remaining 12 were beyond the possibility of surgical relief. In some of these the results are described as nothing less than astounding; in one case, for instance, the patient was so prostrated and anemic from long continued, profuse hemorrhages that a fatal termination was expected almost any minute, and yet after a few applications of 50 to 170 mg. of mesothorium for twenty-four to forty-eight hours at a time the hemorrhages ceased entirely, the crater contracted to a narrow slit, and the patient recovered to the extent that in a couple of months she was able to return to her home in another city; two months later her physician reported her still in apparently perfect health. The remaining 98 patients were still being treated at the time of writing, but had been under observation for too short a time to permit Döderlein to draw any definite conclusions with regard to them; a report upon them is promised later.

In addition to these cases which had never been operated upon, a number of patients suffering from recurrences following radical operations were treated, for the most part with rather poor results. In three instances, however, apparent cures were obtained of extensive vaginal recurrent masses, which had gotten beyond the possibility of further operative removal. Nine cases of mammary carcinoma were also treated, with 2 apparent cures, but in 4 cases of recurrence following amputation of the breast no improvement was noticeable. Döderlein has not tried exposing the carcinoma surgically and then subjecting it to radiation, as has been recommended by some writers, but has found this type of malignant disease extremely difficult to influence when treated merely by applications through the skin.

With regard to unpleasant secondary effects, Döderlein says that until the technique is more fully perfected these are bound to occur to a certain extent, and must be accepted as the price paid for knowledge that is being obtained. Among the most prominent of these disturbing factors is fever, which is sometimes high, and of many weeks duration; it is evidently the result of absorption of considerable quantities of catabolic products. The best way to avoid it appears to be thoroughly to curette away all superficial malignant tissue, especially where this



is present in large amounts, as in the cauliflower types of cervical cancer, before applying the mesothorium. Another unpleasant effect, which occurred as long as lead was used as a filtration capsule, was the occurrence of a white false membrane on the surface of the destroyed tissue, this soon producing a profuse, very foul smelling discharge, but since replacing the lead capsule by one of nickled brass this trouble has been entirely done away with. Rectal tenesmus, painful defecation, and in two cases, stricture formation, were other unwished-for results of the treatment, and in four instances, recto-vaginal fistulæ subsequently developed.

*Report from the Schauta Clinic in Vienna.* A review of some very preliminary impressions from the Schauta clinic upon the use of radium in the treatment of uterine cancer was also given in these pages last year.<sup>1</sup> Since then, Schauta<sup>2</sup> has reported his further experiences after a more thorough trial, dividing his cases into three general groups according to the technique employed. In the first series of 13 patients, treated by the application of 50 to 100 mg. of radium uninterruptedly for from 3 to 11 days, and again in like manner after an interval of 12 to 22 days, the results were most discouraging, not to say disastrous. One case of this series was a carcinoma not of the uterus itself, but of the vulva; the disease appeared to be healed locally, but the patient died from a pyelonephrosis. A second case was one of recurrence after operation for ovarian carcinoma; the recurrent mass, situated in the vaginal vault, disappeared, but the patient died from metastatic growths in the abdomen. The remaining 11 cases were all cancers of the uterine cervix. Three of these patients withdrew from treatment before any appreciable effect had been produced, and the other 8 all died and came to autopsy. During the treatment a steady loss of weight, with diarrhea, tenesmus, fever, vomiting, headaches, cachexia, and reduction in blood count formed the elements of a very discouraging clinical picture. At autopsy, severe necroses and fistulæ were found, with diphtheritic and purulent inflammations of the rectum and bladder, ulcerative sigmoiditis, and ulcerous processes in the pelvic coils of ileum.

In spite of these exceedingly unfavorable results, a noticeable point brought out by the autopsies was the total absence in every instance of macroscopic or microscopic traces of *local* carcinoma. All the tumors had been inoperable, and were associated with massive parametrial infiltration; at autopsy this latter tissue was likewise found free from carcinoma except in two instances, where a few small foci were present in the pelvic walls, far from the original site of the growth.

In the second series of 11 cases a somewhat less violent method of applying the radium was tried, the tube being inserted only at night, and removed during the day; this was kept up for one or two weeks,

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1914, p. 195.

<sup>2</sup> Zentralbl. f. Gyn., 1914, xxxviii, p. 961.

sometimes with interruptions of several nights between applications. After an interval of 19 to 42 days, a second series of treatments, only 3 in number, however, was undertaken. The dosage used was still large, 100 to 150 mg. of radium, filtered, as in the first series, through about 2 mm. of lead. Of these 11 patients, 1 died; this was a case of chorio-epithelioma, which appeared locally cured, but had apparently produced metastases in the lungs. Six patients stopped treatment, either voluntarily, or were advised to do so, as apparently nothing was being accomplished. The remaining 4 appear to have achieved at least a *primary cure*; *i. e.*, local evidences of the cancer have disappeared, but as the observation periods since cessation of treatment cover only a few months, nothing whatever can be said as to permanent results. In some of the patients of this group disagreeable symptoms similar to those occurring in the first series were noticed for a time, but disappeared when the intensity of the radium applications was reduced.

In the third, most recently treated group of patients, therefore, the dosage was still further reduced. The general scheme of procedure here was to give 5 to 8 exposures of twelve hours each, at intervals of one to several days, then allow an interval of three to four weeks, followed by a second, but shorter series of exposures; and in some cases, after another interval of two to three weeks, a third series was given. The quantity of radium used was greatly reduced also, varying from 30 to 50 mg.; it was filtered through 1.1 mm. of gold, 1 mm. of platinum, and 0.75 mm. of brass. In this manner, 11 patients had been treated and discharged up to the time Schauta prepared the report, and 16 more were still under treatment. One case of cervical carcinoma died from hydronephrosis due to pressure of indurated parametrial tissue on the ureters, but at autopsy no cancer could be found. Three cases were discharged somewhat improved, and the remaining 7 appear so far to be cured. Of these, 2 were fundal and 4 cervical cancers; the seventh was a case of recurrence following a panhysterectomy. With two exceptions, they were all inoperable, and in these two operation was inadvisable, because of associated conditions. In this group also occasional elevations of temperature occurred during treatment, but in no instance were fistulae or necroses produced, and the weight and general condition of the patients showed marked improvement. The observation periods of these cases since discharge range from one to five months only.

As a result of these observations, Schauta says he will continue to operate on all operable cases, but will afterward subject them, as well as all inoperable cases, to radiation carried out according to the general technique employed with the third group reported above, realizing that in his original attempts he far overshot the mark with regard to dosage and time of exposure.



RADIOTHERAPY OF CHORIO-EPITHELIOMA. Notwithstanding the enormous amount of attention that has been given in the past few years to the radiotherapy of malignant tumors of various sorts, we hear very little of its use in connection with chorio-epitheliomas. Schauta and Sielmann each refer to a case in which it was tried without much success, and Hörmann<sup>1</sup> reports a somewhat similar experience. His patient was forty-four years of age, and had had a hysterectomy for a typical chorio-epithelioma, which had already caused metastatic growths in both labia. These were subsequently removed, but rapidly recurred, and were again removed a number of times, until finally a limit was reached to the possibility of tissue excision. By this time the patient was in very poor condition, and showed signs of extension of the growth to the left parametrium. Uncontrollable vomiting and other symptoms also suggested the possibility of cerebral or other metastases having occurred. As a last resource, therefore, the application of mesothorium in small doses, strongly filtered, was tried. By the end of four months the vomiting had decreased in severity, and the patient showed marked improvement in general health, being able to sit up for several hours each day; the labial growths had entirely disappeared, and the infiltration of the parametrium had decreased in size and become harder. The patient then died suddenly from an apoplectic stroke, and at autopsy numerous metastases were found in the brain and lungs, with fresh hemorrhages in the former. There was also a growth partially surrounding the left ureter; microscopic examination of this showed practically the same condition that has so often been described following the radiation of carcinomas and other malignant tumors, namely, in the superficial portion the tumor cells were completely necrotic and in places calcified, whereas in the deeper areas small groups of intact cells were seen, but always surrounded by dense masses of fibrous tissue, which had evidently increased tremendously under the influence of the rays, with a corresponding gradual depression of the tumor elements. The author believes that this tumor-mass surrounding the ureter would have entirely disappeared had there been opportunity for the application of mesothorium for a longer period of time. The existence of the deep seated metastases of course rendered the case hopeless from the start, but it is interesting to see that, locally at least, a chorio-epithelioma can be destroyed by radiotherapy exactly as can a carcinoma. In view of the great metastatic tendency of these tumors, however, it would seem that little hope should be placed on this mode of attack unless it be instituted in the very earliest stages. A case of this type, which has recently come under my personal observation, is referred to below.

<sup>1</sup> Zentralbl. f. Gyn., 1914, xxxviii, p. 1128.



FAILURES AND ACCIDENTS FOLLOWING RADIOTHERAPY. In view of the great enthusiasm which has been aroused by the subject of radiotherapy, it is well to take note occasionally of some of the failures and disasters which have been associated with it, as well as of the apparent successes. It must be admitted that the literature has been much fuller of the latter than of the former; it is of course only natural that investigators should be less anxious to rush into print with their failures than with their successes, but, as has been said, the general attitude toward radiotherapy is showing of late a marked change toward a recognition of its weaknesses, and an abandonment of extravagant claims, due undoubtedly to the fact that with longer periods of observation cases which at first sight appeared miraculous cures are turning out to be by no means complete successes. One of the best known German pathologists, von Hanseemann,<sup>1</sup> comments upon the numerous reports of the examination of uteri and other organs removed after extensive radiation, in which the statement frequently is made that practically the entire organ was composed of a dense fibrous stroma, with merely scattering cancer cells so markedly degenerated that their complete disappearance must have been merely a matter of a short time. Von Hanseemann points out the unreliability of such judgments, however, for while it is undoubtedly true that cancer cells do undergo very definite and characteristic morphologic changes after exposure to radiant energy, increasing experience shows that we cannot judge from the histologic appearance of such a cell as to the state of its vitality, and that, moreover, even when all malignant tissue has apparently been destroyed, the case may still go on to an unfavorable termination. He has had these facts forcibly brought to his attention, he says, by the following two cases, which have recently come under his observation.

The first was a patient, aged thirty-two years, who had received 20,000 milligram-hours of mesothorium treatment for a uterine cancer; subsequently the uterus was extirpated, and was found entirely free from malignant cells. After operation, the abdominal incision was subjected to further radiation, with the idea of preventing a recurrence, in spite of which ulceration soon began, but a small bit of tissue, excised from the edge of the ulcer, showed merely a few scattered, apparently completely degenerated carcinoma cells embedded in dense connective tissue. Notwithstanding further mesothorium treatment, the ulceration rapidly increased, until a great cloaca had formed, involving the bladder, vagina, and rectum, a truly deplorable condition, the patient eventually dying in profound sepsis. At autopsy the entire pelvis was found filled with indurated masses, which on microscopic examination proved to consist of dense fibrous stroma, extensively infiltrated with actively proliferating carcinoma. The second case presented almost identical

<sup>1</sup> Berl. klin. Woch., 1914, li, p. 1064.

features; the patient was about the same age, and was treated for a squamous carcinoma of the cervix, which was apparently destroyed, but subsequently a large cloaca developed as the result of ulceration, and the patient died, autopsy revealing the same conditions as in Case 1.

Von Hansemann thinks that while the development of the carcinomatous masses in the pelvis in these cases cannot be attributed to the treatment, it certainly seemed to him that the ulcerative process advanced with greater rapidity than would ordinarily occur, and he believes therefore that the radiation probably exerted a stimulant action upon the cancer, as a result of which its intensity of growth was increased, rather than inhibited.

The occurrence of marked inflammatory reactions after exposure of tissue to radiation is of course a well-known phenomenon; that this may affect the peritoneal cavity with the gravest results is shown by a case reported from Döderlein's Clinic,<sup>1</sup> in which both *x*-rays and mesothorium has been used in the treatment of a myoma. The tumor was a large one, reaching to the umbilicus; two intra-uterine applications of 50 mg. of mesothorium were made, for twenty-four hours each, within a period of one week, and in addition to this, *x*-ray exposures were given. A few days after being discharged from the clinic the patient began to show signs of peritonitis, from which condition she died shortly after; as no autopsy was permitted, it could not be determined absolutely that the mesothorium treatment was the cause of the peritonitis, but there was no other reason whatever for its occurrence. Henkel<sup>2</sup> also reports two cases of uterine cancer treated with mesothorium, in which, in spite of gradual disappearance of the cancer, the patients developed high fever, peritoneal irritation, and severe cachexia.

The well known Scandinavian surgeon, Røvsing,<sup>3</sup> appears to be anything but an advocate of radiotherapy in the treatment of malignant tumors, and reports some very unfavorable results from the use of radium in this connection. He thinks it not only does not check the growth of cancer, but that it rather acts as a stimulant, since he has seen a number of cases in which small, comparatively benign, superficial growths were fanned into rapid and malignant proliferation following exposure to radium. His results were so unfavorable that he thought the technique must be at fault, and therefore went to Heidelberg in order to study the methods employed there, but found that his technique had been correct in every particular. In several of his cases growths which could easily have been removed surgically in the first instance were rapidly brought by the use of radium to an inoperable condition. It is only fair to state in this connection, however, that in reply to this

<sup>1</sup> Münch. med. Woch., 1914, lxi, p. 225.

<sup>2</sup> Ibid., p. 227.

<sup>3</sup> Hospitalstidende, 1914, lxii; Journal of American Medical Association, 1914, lxiii, p. 520.

paper, Tscherning<sup>1</sup> protests against Rovsing's conclusions, and declares that all the cases on which he based them must have been hopeless from the start, as is evident from the published details, or else the technique was at fault. He states that in 201 cases treated at the Copenhagen radium station during recent years there have been no experiences similar to Rovsing's.

**IMPORTANCE OF ADEQUATE DOSAGE.** Sachs<sup>2</sup> warns particularly against the employment of too small doses of the  $x$ -rays in the treatment of carcinoma, because of the danger of merely stimulating the tumor to increased rapidity of growth. While admitting the difficulty of judging whether a rapid increase in a malignant tumor is the result of any therapy that has been applied, he says he has observed three cases in which this opinion certainly seemed justified. The first was a vaginal carcinoma, which recurred after an extremely radical operation; following small doses of  $x$ -rays (30 to 40-X) the recurrent nodule appeared to take on rapidly increased growth, and in a few months led to the death of the patient. The second case was a cervical carcinoma, also subjected to radical operation. Almost a year later a small nodule was palpable in the left parametrium; following weak radiation this took on exceedingly rapid growth, and in a short time formed a large mass filling the left side of the pelvis, and ulcerating into the rectum. The third case was another type of malignant tumor, an osteo-sarcoma of the pelvis, which had formed an insuperable obstacle to labor, and had necessitated the performance of a Cesarean section a short time before. Following a series of weak Röntgen treatments it grew rapidly in size. In all these cases, the author states, the course of the process seemed to him, and to others who observed them, to show a distinct influence of the insufficient  $x$ -ray doses in stimulating the unusually rapid and malignant course of the tumors.

**Other Non-operative Methods of Treating Cancer.** **EXTRACTS OF CARCINOMATOUS TISSUE.** The possibility of attacking malignant tumors by means of extracts of their own substance, in the hope of inducing in the body the formation of some antagonistic substance, is by no means new, and reports of such attempts crop out in the literature from time to time. For the most part these efforts have been dismal failures, and have been given up after a short time, as has been previously pointed out in these pages.<sup>3</sup> Within the past year or two, however, at least two men have come forward with a good word for this type of treatment, one of them being distinctly enthusiastic, the other somewhat more reservedly so. The first of these, Lunckenbein,<sup>4</sup>

<sup>1</sup> Ugeskrift for Læger, 1914, lxxvi; Journal of American Medical Association, 1914, lxiii, p. 714.

<sup>2</sup> Monatschr. f. Geb. u. Gyn., 1914, xxxix, p. 507.

<sup>3</sup> PROGRESSIVE MEDICINE, June, 1912, p. 165.

<sup>4</sup> Munch. med. Woch., 1913, lx, p. 1931.



published something over a year ago a paper warmly recommending the use of cancer extracts as a method which could be used by any practitioner at least as a last refuge in inoperable cases; he stated that he had seen undoubted benefit from it in some instances, but did not give any details as to selection of cases or results. In a later paper, the same author<sup>1</sup> retracts what he originally said about the method being available for the general practitioner, and recommends strongly that it be limited to well equipped hospitals. This is due to certain technical difficulties in the preparation of the extract, and also to the fact that increasing experience has shown much the best results to be obtained when the material is administered intravenously, rather than by intramuscular injection, as had formerly been his practice. This necessitates the use of the utmost care throughout in the preparation of the extract, which is finally sealed in glass ampoules of from 5 to 20 c.c. capacity, and may then be preserved on ice for four or five weeks without apparent deterioration.

Lunckenbein reports that within three days of the intravenous administration of cancer extract he saw the most remarkable improvement in a case of inoperable mammary cancer; a large packet of nodes in the supraclavicular fossa disappeared, a large mass of axillary nodes became greatly shrunken, and the firmly fixed tumor mass itself was freely mobilized. In another instance, a recurrent mass after the removal of a thyroid carcinoma showed improvement in twenty-four hours, and had completely disappeared by the end of two weeks; this tumor had previously been threatening life from suffocation. In summing up his results from the treatment of 15 cases, the author says the method is of the greatest value because of the rapidity with which it relieves pain and produces a regression of inflammatory infiltration surrounding tumor masses, and also because of the fact that the same effect is produced upon distant metastases as upon the primary growth, thus differing essentially from the purely local action of the various forms of radiant energy. He says the intravenous administration is followed by such energetic activity that apparently extracts from foreign tumors work almost as well as autogenous ones, but no effect whatever was produced in a case of sarcoma by a carcinoma extract. As yet, Lunckenbein has used this treatment only in hopelessly inoperable cases, but hopes that soon the results will be such as to justify its application to patients with less advanced disease, in whom even better results might naturally be expected.

In a third communication, Lunckenbein<sup>2</sup> says that as a result of an experience now amounting to over 40 cases, he feels justified in predicting that the intravenous injection of tumor-extracts will prove in the near future to be the most efficient method of treatment for cancer and

<sup>1</sup> Munch. med. Woch., 1914, lxi, p. 18.

<sup>2</sup> Ibid., p. 1017.

sarcoma. In this paper he discusses from a theoretical standpoint the manner in which the effects are probably produced, basing his ideas on the discoveries of Abderhalden in the field of protective or defensive ferments ("Abwehrfermente"). As Abderhalden has shown, the cells of a malignant growth are practically foreign elements to the organism, living an independent, parasitic existence, and producing ferments, by means of which the food material of the host is changed and adapted for their own support; these foreign elements and ferments act on the host, in turn, by stimulating the production of antagonistic defensive ferments, whose function is to destroy the malignant, or foreign cells. It seems probable, therefore, that by the injection of extracts of malignant tissue, containing tumor-proteins, the production of specific, antagonistic ferments is stimulated. That this is actually what happens is shown by the possibility of demonstrating, by means of the Abderhalden reaction, the presence of increased quantities of such ferments in the blood after the injection of tumor material. The body is thus, as it were, merely assisted in its fight against the invader, the process being in many points analogous to vaccine therapy. It appears, however, that it is not necessary to employ autogenous extracts, nor even in all cases those from the same character of tumor as the one to be treated, for the author says he has obtained many of his best results in different patients, having different types of growths, with extracts from a single mammary carcinoma; the fear that in any given case, as improvement proceeds, material for further injections will be unavailable, is therefore of no weight. He considers it necessary, in order to produce lasting results, to continue the treatments over a long period of time, and says that in doing this he has never seen any disturbances suggestive of the occurrence of anaphylaxis.

The other investigator who has interested himself in the clinical use of tumor extracts is Schubert,<sup>1</sup> who reports a series of experiments somewhat similar to those of Lunckenbein, for work along these lines, even when applied clinically, can hardly as yet be considered more than purely experimental. Schubert's technique is as follows:

In dealing with a carcinoma—of the cervix, for instance—the pieces of cancer tissue removed by excochleation from the carcinomatous crater are freed as much as possible in salt solution from adherent particles of necrotic material. They are then placed in a sterile flask, and barely covered with 50 per cent. alcohol; after twenty-four hours the entire contents of the flask are passed through a fine, sterilized meat chopper, the resulting hash is ground in a mortar, and is finally forced under high pressure through a sterile meat press. The fluid thus obtained is thinned by the addition of salt solution until all stringiness is lost, and is then sucked by means of a water pump through a

<sup>1</sup> Monatschr. f. Geb. u. Gyn., 1914, xxxix, 487.



coarse Berkefeld filter. Placed in sterile flasks, the tumor extract is now ready to use. The alcohol is added to prevent decomposition of the fluid, and also with the idea that it may have some bactericidal effect upon any organisms that may be present in the tissue. (It is to be noted that Schubert is willing to obtain his material from surface scrapings of a carcinomatous crater—tissue which is sure to be already infected, whereas most other workers with similar methods have insisted that material shall be obtained only from “closed” tumors, *i. e.*, ones which are not ulcerated, and do not communicate with the external surface.) He says that, so far as he has been able to determine, the addition of the alcohol has no effect upon the activity of the tumor extract. Since a bacteriological test of its sterility is rendered impossible on account of the alcohol, he proceeds very cautiously in each instance, first injecting 1 c.c. subcutaneously, and awaiting the result; then after a few days, daily subcutaneous or intramuscular injections of 5 c.c. are begun. In some instances he has also used intravenous administration. In no case has the injection even of large doses been followed by abscess formation or temperature rise, the reaction being limited to moderate reddening and tenderness at the site of injection, and often also in the tumor itself. In no case has anything suggestive of an implantation metastasis occurred at the site of injection.

The results which Schubert is able to record are briefly as follows: Two cases of advanced inoperable carcinoma of the cervix showed no effect from the treatment. A man with sarcoma of the right tonsil and metastases in the cervical glands showed evidences of marked improvement, but soon withdrew from treatment on account of the slight pain caused by the injections. A woman, aged thirty-one years, with recurrence in the cervical lymph nodes following operation for mammary carcinoma, had had a second operation, followed by Röntgen treatment, notwithstanding which renewed recurrences appeared; following a series of injections, chiefly with extracts of three extirpated nodes, the remainder rapidly decreased in size, some disappearing entirely. Very distinct benefit apparently resulted in this case. In another patient with an advanced breast cancer, an older woman, injections were begun after operation (the axillary nodes were not removed, merely the tumor itself being extirpated to furnish extract material); marked shrinkage of the axillary nodes took place following the injections, but the patient died with symptoms suggestive of pulmonary metastases. A man with inoperable carcinoma of the tongue received without any benefit injections from a mammary carcinoma, no material from his own tumor being available. A young girl with extensive sarcoma of the thigh received intravenous injections of material removed at operation, with no benefit. A patient with inoperable gastric carcinoma received intravenous injections of extract from an extirpated liver metastasis; beyond a temporary subjective and objective improvement of moderate degree, no benefit was noted.



Although these results are far from brilliant, the author thinks that the improvement which occurred in the tonsillar sarcoma, and in the lymph nodes of the two breast cases, shows that something is to be accomplished by the use of extracts, if the method can be properly worked out. He suggests that perhaps it may be possible in the future to produce the tumor-destroying substances in the patient's blood by injecting the extract not into the patient himself, but into animals, and then using the latter's serum, on the principle of antitoxin production.

CHEMOTHERAPY. While the attempts to cause the destruction of malignant growths by the introduction into the host's circulation of chemical substances, supposed to have a specific action on tumor tissue, have not yielded the practical results hoped for following some of the original experimental work in this field, here and there a report appears of clinical investigations with such substances, generally used in combination with some form of radiotherapy. Thus, the injection of colloidal metals in conjunction with Röntgen treatments has been tried at the Dresden Gynecologic Clinic by Klotz<sup>1</sup> who says that in this way great benefit may be obtained from chemotherapy, whereas when it is used alone, the results are in most instances entirely negative. This is due, he thinks, to the fact that the colloidal salts of the heavy metals, which are the substances chiefly used in this connection, are all active protoplasmic poisons, too large doses of which for the normal body tissues to withstand would have to be given in order to secure from them alone any appreciable effect upon cancer tissue.

The technique of administration is, in Klotz's estimation, of prime importance if disagreeable sequellæ are to be avoided. He gives very small doses, not over 5 c.c. of a 0.02 per cent. solution of electro-cobalt or colloidal selenium, diluted with 50 c.c. of normal salt. The solution must be absolutely non-decomposed, and perfectly clear, the least cloudiness indicating that the metal is no longer in the colloidal state. The injection is made slowly, taking at least fifteen minutes; an ordinary salvarsan burette is excellently adapted for this purpose. Given in this manner, and not repeated oftener than every nine days, the author has found the injections to be followed by practically no reaction whatever, and cites the case of one patient who was given an injection at 4 P.M., was then x-rayed for two hours, went to a dance that evening, and appeared the next morning for another x-ray treatment, feeling perfectly well. He uses this treatment extensively on ambulatory patients, placing them under the x-ray tube immediately after giving each injection, and letting them go home in two or three hours.

The advantage claimed by Klotz for this combined treatment is that the tumors (uterine cancers) all seemed to disappear as quickly in the deeper or central portions as in the more superficial ones, and nodules

<sup>1</sup> Strahlenther., 1914, iv, p. 623.

lying deep in the pelvis showed as rapid shrinkage as those nearer the surface and much more exposed to the rays.

*Enzytol.* It was shown some time ago by Werner<sup>1</sup> that the effect of radiant energy upon tissues can be imitated by that of certain chemical substances. If ordinary eggs are exposed to the action of radium, there arise decomposition-products from the yolk-lecithin, the injection of which into animals causes the same tissue changes as would be produced by the direct action of radium or the  $x$ -rays. It was further found that these decomposition-products may be obtained in other ways than by the action of radiant energy upon the egg, but exert nevertheless the same effect on animal tissues. This effect is caused chiefly by one constituent of these substances, *cholin*, which for practical purposes is used chiefly in the form of the non-toxic cholin borate, a 10 per cent. solution of which has been put on the market under the name of "enzytol." This substance has been used considerably in the form of intravenous injections in conjunction with radiotherapy, with the idea that it "sensitizes" tumor tissue to the action of the rays, and thus increases the efficiency of the latter. According to Ritter and Allman,<sup>2</sup> however, this conception is false; enzytol does not sensitize tissue, but independently produces changes in it similar to those produced by the rays.

In order to test out carefully the action of this substance, these authors gave to three women suffering with inoperable uterine cancers three injections of enzytol, each patient receiving the same doses of 5, 8, and 10 c.c., diluted with four parts of salt solution, the first two injections being given on succeeding days, the last after an interval of two days. The injection was followed in most instances by a rather violent reaction—flashes before the eyes, diplopia, headaches, and in some cases collapse; these disturbances were only temporary, however, and soon passed off. There was also in most instances a distinct, but short-lived rise in the leukocytes, with slight fall of blood-pressure. No effect upon metabolism could be observed. The method of procedure was first to expose one side of the patient's abdomen to a carefully measured dose of  $x$ -rays, and note the amount of reaction; five weeks later the enzytol injections were given, and immediately after this the other side of the abdomen was exposed to the same dose of  $x$ -rays, and the reaction noted, the results being judged according to primary erythema, pigmentation, and true erythema. As the tests were carried on solely to determine the reaction of the organism to enzytol *plus*  $x$ -rays, no particular effort was made to influence the tumors, which were all in a hopeless stage, these patients merely being chosen for the investigation because the authors did not feel justified in giving the enzytol injections to normal individuals.

<sup>1</sup> Strahlenther., vol. i.

<sup>2</sup> Ibid., 1914, iv, p. 398.

It was found that there was no difference in the occurrence of primary erythema between the sides of the abdomen radiated before and after the injections, but pigmentation was more marked and more lasting after than before the administration of enzytol, while the most marked effect of all was seen in the production of true erythema. After the injections this first appeared as a result of about half the dose of rays necessary to produce it previously; it occurred in half the time; and its intensity was much greater, *x*-ray doses which without enzytol produced only the suspicion of a reaction now resulting in second degree burns with necrosis.

From these results, the authors consider it demonstrated that enzytol is in fact able to imitate the effects of Röntgen therapy. How far it may be able clinically to assist or replace it, however, is not so easy to answer. Since after the use of enzytol, the radio-dosage that the skin is able to bear is cut in half, the cholin preparation must effectively replace half the effect of the rays before any advantage is to be gained from its use, and it has not yet been determined whether large enough doses for this purpose can be given with impunity. Where a tumor can be directly exposed to the rays, however, so that their burning effect on the skin or other healthy tissue does not come into consideration, or where a radium capsule can be placed in immediate contact with the tumor mass, the use of enzytol in addition may well be considered, Ritter and Allman think, on account of its synergistic action.

*Chemotherapy in Ovarian Sarcoma.* Last year we referred to a remarkable case reported by Seeligmann,<sup>1</sup> of the apparent cure of a malignant condition by combined radio- and chemotherapy. The patient was a girl of twenty-four years, from whom an ovarian sarcoma had been removed by operation. Soon there was a recurrent growth filling the abdomen, and invading the spinal column, with resulting nerve symptoms. Exploratory laparotomy showed the condition to be absolutely inoperable, but following treatment by repeated *x*-ray exposures and intravenous injections of a chemical preparation, "arsazetin," rapid disappearance of the growth took place, with coincident improvement in the girl's condition, until eventually she was able to be up and about, and was apparently restored to health.

In a later communication to one of the medical societies, Seeligmann<sup>2</sup> reports on the further progress of this exceedingly interesting case. Following the original disappearance of symptoms, the girl remained entirely well for several months, but in July, 1913, began to complain again. Nothing was discoverable in the abdomen, or at the site of the former spinal involvement, but immediately adjacent to this region there was a new metastatic focus, involving the I and II lumbar vertebræ. This was demonstrated by the *x*-rays, and was associated

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1914, p. 207.

<sup>2</sup> Monatschr. f. Geb. u. Gyn., 1914, xl, p. 423.



with complete paralysis of both legs and the bladder. A new series of arsazetin injections and x-ray exposures was begun, and after several weeks of this treatment the patient again appeared entirely well, except that the gibbus had increased somewhat. This condition persisted until December, when a severe attack of herpes zoster occurred in the field of distribution of the II lumbar nerve on the left side, with again complete paralysis of bladder and legs. After the herpes had healed, energetic treatment was carried out as before, and again all symptoms cleared up. At the time of report (May, 1914), the patient was able to walk without difficulty and with no limp, and presented an appearance of perfect health.

While the author admits that of course the condition may, and probably will, recur, he thinks the case illustrates the power of treatment by a combination of the intravenous injection of arsazetin with x-ray exposures to hold completely in check, and indeed actually to destroy repeated recurrences of a highly malignant type of growth, the character of which was definitely proven by histologic examination of the primary tumor to be a spindle-cell sarcoma.

THE PERCY TREATMENT OF INOPERABLE CARCINOMA BY HEAT. In a number of papers published during the year, J. F. Percy,<sup>1</sup> of Galesburg, Ill., has again brought before the profession his method of destroying cancer tissue by the use of carefully regulated heat. He says that, aside from radiant energy, which has as yet a distinctly limited field of application, the most efficient agent known for the destruction of malignant tissue is *heat*, applied in the form of hot air, hot water, steam, electro-coagulation, fulguration, or by the actual cautery. For the purpose of applying heat-energy to inoperable carcinoma masses, Percy has found an electric heating iron most satisfactory; it is simple, easily portable, and can be perfectly regulated by means of a rheostat. He makes a great point of the fact that he does not apply heat of a degree sufficient actually to *burn* the tissues, as does a cautery, but merely enough to make the cancerous mass so hot that the hand of the surgeon, encased in a medium weight rubber glove, cannot hold it. When this degree of heat is reached and maintained for twenty minutes, the cancer-cells are absolutely killed, while the normal tissue-cells are not injured. The important thing, he says, is not to convert the pathological tissue into charcoal, since the charcoal, or carbon, thus formed inhibits the further dissemination of heat through the cancer mass, and also prevents drainage, thus permitting the absorption of a larger quantity of broken down cancer cells than most of these patients can tolerate, with fatal results in many instances.

This heating iron, or "cold cautery," is used through a water-cooled speculum, which the author has devised. The iron should not be hot

<sup>1</sup> Journal of American Medical Association, 1914, lxii, p. 1631; Medical Press and Circular, 1914, xcviii, p. 165; Surgery, Gynecology, and Obstetrics, 1914, xix, p. 452.

enough to scorch a pledget of white cotton if laid on it even for half an hour. No smoke, or smell of burning tissues should arise, and the ear placed near the speculum should hear only a gentle simmer or bubbling while the heating head is in the diseased mass. Experimental work has convinced Percy that cancer is destroyed when the temperature of the mass is raised to  $50^{\circ}$  or  $55^{\circ}$  C., while the vitality of normal tissues is not affected until the temperature exceeds  $55^{\circ}$  or  $60^{\circ}$ . The basic idea of his treatment is therefore dissemination of heat throughout the gross primary mass of cancer. He thinks there is no other method that will destroy so great an area of malignant tissue, with a minimum of harm to the uninvolved structures; after the primary mass is thus removed, other measures, such as the *x*-rays, may be employed to attack the outlying foci. Percy does not always attempt to destroy a large mass of carcinoma at one sitting, but gives two or even three applications of heat at intervals of a couple of weeks. He strongly advises against the use of the curette, or other operative measures in addition, as these only tend to spread the growth. Even where a radical hysterectomy is considered feasible in early cases, he advocates an application of heat three or four weeks previously. While leaving statistics for a future report, he states his belief that a large number of cases, not absolutely hopeless from the start, will show approximately 50 per cent. remaining free from recurrence after five years following his method of treatment.

#### NON-MALIGNANT CONDITIONS OF THE UTERUS.

**Radiotherapy.** A comprehensive report on the use of radioactive preparations in the treatment of non-malignant uterine conditions has been issued from the Freiburg clinic by Gauss and Krinski.<sup>1</sup> Their work has been done with mesothorium, which they at first applied in the same way as they had been doing the *x*-rays, *i. e.*, through the abdomen, using for this purpose flat applicators, which were protected with a suitable filter, wrapped in several layers of gauze, and placed on the lower portion of the abdomen. In this way many fields could be utilized, and in one case of uterine hemorrhage complete amenorrhea was produced, but on account of the great distance of the capsule from the tissue to be affected, the loss of rays was enormous, and the authors have now adopted the intravaginal, intracervical, or intra-uterine methods of application, using for this purpose small cylindrical capsules. They have not as yet definitely determined which of these sites gives the best results; in some cases of intracervical or intra-uterine application burns of the surrounding tissue occurred, resulting in some cicatricial contraction of the cervical canal, but since the substitution of thin gold capsules covered with rubber for the lead ones formerly used, no trouble

<sup>1</sup> Strahlenther., 1914, iv, p. 440.

from this source has been experienced. The dosage in practically all cases was 50 mg. of mesothorium, left in place for forty-eight to seventy-two hours at a time. Generally about three such applications, at intervals of two and one-half to three weeks, were necessary to produce a cure, the total exposures averaging about one hundred and seventy-five hours.

In this manner 102 cases of myoma and metropathic hemorrhage were treated. Of these, 50 were still under treatment at the time of report, and 52 had been discharged as cured (*i. e.*, a condition of amenorrhea had been produced). The treatment in these cases was undertaken irrespective of the age of the patient, size of the tumor, presence of adnexal lesions, or degree of anemia, and even in some instances in spite of the presence of a submucous tumor palpable through the cervical canal. Somewhat more than half the patients were cured with mesothorium alone; in the others  $\alpha$ -ray exposures were given in addition. This combination enables the total time of treatment to be materially shortened, for the intervals between the abdominal  $\alpha$ -ray exposures can be utilized for the vaginal application of mesothorium, a final cure being thus obtained in most instances after three Röntgen sittings and two mesothorium applications. In contradistinction to the opinion expressed by some of the French authors, that good sized myomatous tumors cannot be made to disappear by the use of radioactive salts alone, uncombined with the  $\alpha$ -rays, Gauss and Krinski are able to report almost complete disappearance of the tumor in all their cases treated only with mesothorium, with one exception, in which the growth shrank only to about half its original size.

With regard to secondary effects, the authors state that about 50 per cent. of their patients complained of a certain amount of malaise following the treatments, with occasionally nausea and vomiting, and in 7 per cent. there was a rise of temperature to  $102^{\circ}$  or more by axilla. In the earlier cases of the series, the mesothorium capsule was always removed immediately upon the occurrence of fever, but experience showed that the temperature invariably returned to normal within a few hours, so that now the exposure is not shortened on this account. So far as menopausal disturbances are concerned, the authors think these are less after mesothorium than after Röntgen sterilization. In a few cases a vaginal erythema was produced, accompanied by a profuse yellowish leucorrhea, which, however, always disappeared in a few weeks. It seems probable that in these patients the dose applied had been slightly excessive.

Although much pleased with these results, Gauss and Krinski state that they have not adopted mesothorium treatment routinely in myoma and metropathia cases, for practically the same effect can be obtained much more cheaply with  $\alpha$ -rays; they therefore reserve their mesothorium chiefly for malignant tumors, and use it in the other cases



only when there is some particular reason for hastening the cure, or the condition proves refractory to the  $x$ -rays.

RÖNTGEN THERAPY IN PRIVATE PRACTICE. Sielmann<sup>1</sup> reports some results obtained from  $x$ -ray treatment in 100 consecutive cases of various gynecological affections in his private Röntgen institute. These cases were divided into the following groups:

32 cases of myoma.

10 cases of metropathic hemorrhage.

8 cases of climacteric hemorrhage.

9 cases of dysmenorrhea.

16 cases of malignant disease of the genitalia.

25 cases of disease of the mammary gland.

With regard to technique, Sielmann says he follows for the most part the Hamburg method of moderate dosage, and has not seen fit to adopt the intense radiation advocated by Krönig and his followers. In treating myomas and metropathias he uses 7 fields: 4 on the abdomen, 1 on each side, and 1 on the back, each field being given an exposure of 10 to 15-X, and not employed again till after the lapse of three weeks. Often two fields are attacked at once by the use of two tubes. In cases of climacteric hemorrhage and carcinoma two fields are used, one in front and one behind, with a vaginal exposure as well in the cancer cases. For dysmenorrhea but two fields, and very moderate doses, are employed; in the breast cases, two or three fields, with especial attention to the axilla, both on the sound and affected side.

Of the 32 myoma patients, 20 were cured, *i. e.*, amenorrhea was produced. In a few instances the tumor disappeared; in the others it was reduced in size, and pressure symptoms were relieved. In 6 cases operation was eventually resorted to; two of these occurred in the early days of the treatment (1911), when the technique was very imperfect, and the others were operated upon because of complications or mistakes in diagnosis. The remaining 6 patients were still under treatment at the time of report. The ages varied from twenty-eight to fifty-three years, three of the women being under thirty-five; in these latter particularly good results were obtained, and the author therefore does not agree with those who would limit the Röntgen treatment of myomata to women over forty, but thinks that it should be more generally applied to just these cases, for there is a possibility of subsequent regeneration of the ovaries, and the occurrence of pregnancy.

In a few instances unpleasant secondary effects were noted, such as erythema, nausea, epigastric pain, headache, constipation, diarrhea, etc., but for the most part these phenomena were only slight, and of brief duration; symptoms attributable to the artificial menopause were insignificant. In spite of the small doses used (90-X was the average

<sup>1</sup> Fortschr. a. d. Gebiet d. Röntgenstrahlen, 1914, xxii, p. 277.

total dose in the myoma cases, and 233-X the maximum) there was only very seldom any marked increase of bleeding at first, such as has always been urged as an objection to the use of moderate dosage by the advocates of the intensive method.

Amenorrhea was produced in 5 of the cases of metropathic hemorrhage, a return to normal menstruation in the other 5. There were no recurrences, and in no case was operation necessary. The doses here averaged 118-X, with a maximum of 250-X. All but 1 of the 8 cases of climacteric hemorrhage were reduced to a condition of amenorrhea; in the one exception the bleeding ceased for a while, but then returned with such violence that hysterectomy had to be performed. This was also one of the earlier attempts (1911). In the 9 cases of dysmenorrhea, a lasting cure was obtained in 5, marked improvement in 3, and no benefit in 1. The average dose in this group was only 27-X, the highest 50-X. No unpleasant sequellæ were encountered. The 16 malignant cases gave varying results; there was some improvement in one inoperable cervical carcinoma, but the patient died suddenly from apoplexy; in two other similar cases there was decided benefit in the cessation of pain and hemorrhage, and disappearance of ulcerating masses. Of 8 cases of recurrence following operation for malignant disease of the uterus, 6 showed improvement, 1 withdrew from treatment, and in 1 (a chorion-epithelioma) treatment was stopped, as increased hemorrhage seemed to result. Four cases of uterine cancer were given prophylactic treatment after operation, none of these as yet showing any recurrence, but all have been less than two years since operation. One carcinoma of the urethra was considerably reduced in size, with relief of the accompanying dysuria. The breast cases likewise gave varying results; some inoperable cancers showed decided improvement, but recurrences were exceedingly common, and careful watching, with repeated treatments, were necessary. The author thinks that all operable cases of uterine or mammary carcinoma should be operated upon, and then subjected to prophylactic radiation, and all inoperable ones subjected to a very thorough Röntgen treatment.

A FRENCH REPORT ON X-RAY THERAPY, as applied to a series of private patients suffering from myomas or metropathic hemorrhage, has been published by Bécélère.<sup>1</sup> His series comprised 66 patients, in all but 6 of whom the uterus was definitely enlarged, this presenting in 24 palpatory findings suggestive of "chronic fibrosis" rather than an actual tumor, the remaining 36 having a definite tumor reaching above the symphysis. In the large majority of the cases the chief complaint was hemorrhage, but in 6 there was no excessive bleeding, treatment being applied here merely to check the growth of the tumor. Two of these latter patients were past the menopause. Two cases were prac-

<sup>1</sup> Strahlenther., 1914, iv, p. 134.

tically failures, but in all the others the uterus became reduced in size, and amenorrhea was produced. Bécélère says that this very high proportion of cures, 96 to 97 per cent., is due to the fact that practically all the patients were referred to him by expert gynecologists or surgeons, by whom a careful selection of suitable cases had been made.

Bécélère firmly believes that the  $x$ -rays exert their influence on the uterus directly, rather than on the ovaries, for the following reasons: (1) In the case of patients treated before the menopause, a marked reduction in the size of the tumor occurs within the first few weeks, before menstruation has ceased. (2) Tumors which have continued to develop *after* the menopause likewise undergo a reduction in size. In both these instances, it appears evident, the author says, that whatever effect is produced must be independent of any destruction of ovarian activity, and he maintains that this direct action on the uterine or tumor tissue is deserving of much greater emphasis than has been accorded to it in the past.

THE CONSERVATIVE BRITISH STANDPOINT ON RADIOTHERAPY is well expressed by Donald<sup>1</sup> in a paper presented at the last annual meeting of the British Medical Association. He says he is strongly opposed to the replacement of operation for uterine fibromyomas by  $x$ -ray treatment, on account of the frequency of complicating conditions. In a series of 201 personal operations, he has encountered the following complications: Ovarian cyst in 13, red degeneration of the tumor in 12, suppuration in the tubes or ovaries in 5, appendicitis in 4, calcareous degeneration of the tumor in 5, fibrocystic tumor of the uterus in 2, carcinoma in 2, adenomyoma in 2, necrotic polypus in 1, hydroperitoneum in 1, a total of 44 complications, representing nearly 25 per cent. of all the cases. Donald says he does not think sufficient time has elapsed since the introduction of the  $x$ -ray treatment to assure us that trouble will not later develop in cases that have been subjected to it. He is willing to concede to Röntgen therapy a place in the treatment of metrorrhagias, but he thinks it should be definitely abandoned for fibroid tumors.

It was brought out very forcibly in the discussion that these views are in the main those of the surgical profession in England today, practically every British speaker assenting to them in every particular. A paper presented by Gauss, giving a résumé of the well known results of  $x$ -ray treatment at the Freiburg clinic, was received with interest, but with marked skepticism, and evidently carried very little conviction.

KELLY'S WORK WITH RADIUM IN THE TREATMENT OF FIBROID TUMORS, ETC. An exceedingly optimistic report on the possibilities of *radium* in the treatment of the various non-malignant conditions of the uterus associated with hemorrhage was presented by Kelly<sup>2</sup> at the 1914 meeting

<sup>1</sup> British Medical Journal, September 26, 1914, p. 531.

<sup>2</sup> Journal of American Medical Association, 1914, lxiii, p. 622.



of the American Medical Association. In conjunction with Burnam, and other of his assistants, Kelly has been using radium for some time in various ways, and is now able to report his results in quite a series of cases of the above-named type. As a result of his observations, he has been forced to the conclusion, which appears to be gradually gaining considerable ground among many radiotherapeutists, that the action of radiant energy is exerted largely, if not chiefly, upon the *uterine tissue itself*, and not, as was formerly believed, solely upon the ovaries. Kelly holds that the rays from radium or the Röntgen tube have a definite and specific action upon the myoma tissue itself, entirely independently of any action they may exert on the ovaries, his grounds for this belief being based on the effects seen after the menopause, and also upon the observation of a couple of cases in which tumors disappeared without the cessation of menstruation. The effects produced are due, he thinks, to an obliterative endarteritis which occurs in the field radiated, with resulting anemia, consequent upon the occlusion of the nutrient vessels.

With regard to technique, Kelly says that with increasing experience his tendency has been toward the use of increasing amounts of radium for decreasing periods of time, both because of the resulting economy and greater comfort to the patient, and because of the better results and fewer complications obtained by this method. Occasionally he reinforces the main treatment by abdominal radiations either with radium or the  $x$ -rays. The principal treatment is given by the introduction of a radium capsule directly into the *uterine cavity*, the patient being anesthetized (gas), thoroughly curetted, and carefully examined under complete anesthesia. The radium salt is placed in a capsule of glass 0.5 mm., platinum 0.5 mm., zinc foil, and rubber 0.3 mm. Cervical application has been found much less reliable than uterine. The quantities of radium used varied greatly according to the type of case, as noted below, the amounts given always representing, however, the equivalent of whatever preparation was actually used in terms of *pure radium element*. The cases have been divided into four groups, as follows:

1. Bleeding uteri in adult women, without demonstrable pathologic lesion, either clinically or on microscopic examination of the endometrium. Of these there were 8 cases. The amount of radium used varied from 60 to 268 mg., the time of exposure from two to twenty-four hours. In 2 cases the bleeding never recurred after the first treatment, 1 patient required two applications, while in the remaining 5, a single normal period occurred after the treatment, to be succeeded by permanent amenorrhea. Menopausal symptoms were marked in only 1 case.

2. Young girls suffering from uterine hemorrhage. In some of these the endometrium showed polypoid changes similar to those noted below in Group 3, in others no demonstrable pathology was present. The differentiation of this group is therefore clinical rather than patho-

logical. It contains 5 patients, with ages ranging from thirteen to twenty-three years. The dosages used here were small, 12 to 60 mg., applied from five to twenty-four hours. A normal menstrual life has been established in four of these girls, while in the fifth amenorrhea was produced, accompanied by pronounced menopausal symptoms. This patient was very anemic, had a bad heart lesion, and was in poor condition generally; the method of treatment differed in this instance from others, in that a large dose of rays was given by abdominal application.

3. Adult women with uterine hemorrhage, the only lesion discoverable being a polypoid condition of the endometrium. In this group there were likewise 5 patients, varying in age from thirty-five to forty-nine years. In one case, abdominal, uterine, and vaginal applications were made, in the others only uterine. The doses varied from 30 to 100 mg., applied from seven to twenty-four hours. One case required the performance of hysterectomy on account of continued hemorrhage, but in the others amenorrhea was quickly produced.

4. Myomas (fibroid tumors). This, by far the most important group, comprises 21 cases of tumors ranging in size from that of a two and one-half months' pregnancy to growths reaching well above the umbilicus. The youngest patient was aged thirty-two years, the oldest fifty-nine years; excessive bleeding was present in 19 cases, normal menstruation in 1, and 1 was past the menopause. In a few there were complications, such as inflammatory disease, cystic ovaries, etc., but the majority of the tumors were uncomplicated. In 16 of the patients amenorrhea was produced, in 2 the menstrual periods were reduced to normal (with coincident disappearance of the tumors), and only 1 was a complete failure, requiring eventual surgical treatment. In this instance, tortuosity of the cervical canal made the introduction of the radium capsule into the uterus difficult, so that applications were made from the abdomen and cervix only. Most astonishing results are reported with regard to shrinkage of the tumors. In every case, except the one failure referred to above, and one other, from which no report was obtainable, marked decrease in the size of the tumor was demonstrated, this often amounting to complete disappearance. Some of the reports on these cases sound indeed almost as if drawn from the field of the supernatural: thus, we read of Case 6, "a huge tumor filling pelvis and lower abdomen has entirely disappeared;" Case 9, "huge tumor filling pelvis and abdomen reduced to the size of a two and one-half months' pregnancy;" Case 14, "tumor six inches in diameter reduced to one inch in diameter," etc. Astounding as these statements may seem at first glance, the standing of their sponsor in the gynecologic world should serve as a check upon the tendency to receive them with too great skepticism, which has been manifested in some quarters.



PERSONAL VIEWS UPON RADIOTHERAPY IN GYNECOLOGY. Concerning the use of the  $x$ -rays in the treatment of fibroids, I personally have very definite opinions, which, however, may be subject to change by the further study of patients after treatment. I do not believe that women under forty years of age should be subjected to  $x$ -rays. I base this objection upon the fact that each year we lay more and more stress upon the necessity for the preservation of all ductless glands. Certainly the ovary in its potentialities must be ranked as one of the most important glands in the body as regards metabolism and maintenance of the nervous equilibrium of the patient. It is quite manifest that while exceptionally the ovaries in younger women are not put out of commission by the use of the  $x$ -rays, nevertheless, its almost uniform action is to render them functionless.

A few cases have been reported in which there has been a recurrence of the menses after a myoma has disappeared, and in one instance, pregnancy subsequently occurred. Isolated cases of this kind, however, are of little value in the discussion, because, like many other similar incidents in medicine, they are reported only because they are unique, and merely prove the exception to the rule. With the American methods of performing hysterectomy for fibroid tumors, the ovaries and even a part of the endometrium may be preserved, and in this way there is no interference whatever with the general nervous and psychic equipoise of the patient—a matter which is of extreme moment in younger women. According to my present view, therefore, I am willing to submit to the  $x$ -rays only those patients approaching the menopause, or those beyond forty years of age. The larger tumors, particularly in younger women, should still be considered within the surgical domain. If a radical policy were instituted, namely, the removal of the tubes, ovaries, and entire uterus, with the necessarily higher mortality and the disagreeable postoperative convalescence which follows, the question I am sure would be debatable. As I have seen the average hysterectomy done in Germany, where the  $x$ -rays has obtained such great vogue, I would not hesitate a moment in choosing the latter in preference to operation, for they are drastically radical in their surgical methods. The average continental surgeon seems to have a morbid anticipation of a malignant change sooner or later in the cervical stump, and, therefore, to obviate this very remote danger does a very extensive panhysterectomy. I am not surprised, therefore, that the mortality rate rises to 6 and 8 per cent. Such methods certainly do not obtain in the best clinics in this country.

It would be most unwise to take up the wholesale treatment of fibroids by the  $x$ -rays, for I feel certain that within a decade the results would be so severely criticized that there would be a tendency to return to surgical methods. There should be no necessity for this, however, for the  $x$ -rays has already proved beyond question that it has a definite



but limited field. Within the last three weeks I have seen three patients, all of whom would, I believe, have been injured by the use of *x*-rays or any other method of treatment than surgical. In one case, there was a calcareous fibroid, to which the ileum was adherent, and which was producing a partial obstruction. The most optimistic Röntgenologist could not have hoped for any radical change in the calcareous mass; in the meantime, however, there was every chance that the obstructive symptoms, which were already threatening, might at any moment have become acute, necessitating an emergency operation under adverse circumstances.

In another case, where the patient complained of pain, the fibroid was associated with chronic appendicitis, the appendix containing a small amount of pus. In the third, there was an early pregnancy; the uterine tumors were closely wedged in the pelvis, and were producing both vesical and obstructive symptoms. Owing to the number of fibroids, it was impossible to make a diagnosis of pregnancy. If, therefore, the patient had been submitted to *x*-ray treatments, the rapid growth of the tumors associated with the pregnancy would unquestionably have precipitated a serious emergency operation. I merely refer to these cases in order to point out the dangers of wholesale treatment of fibroids with the *x*-rays. It is not my desire to detract from, but rather to sustain this method by the judicious selection of cases. In at least 5 of my patients over forty years of age, in whom the chief symptom was menorrhagia, radiotherapy has given ideal results.

As to the use of *radium* for the treatment of cancer, I am conservatively optimistic. We cannot ignore for one moment the large accumulation of favorable literature which has already come before us, detailing the good results obtained by many investigators—indeed, results that border on the miraculous. Two cases that have occurred quite recently within my own experience are startling in their quick change for the better. In one, a woman was treated six weeks ago with 85 mg. radium, applied to a cancer in the vaginal fornix, where a crater had formed the size of an English walnut, extending outward to the pelvic wall. Operation was impossible, because of the intimate relation of the ulcer to the ureter. The radium was applied for twenty-four hours. The cancerous area has now shrunk to a shallow pit, which does not bleed, and is not more than 0.5 cm. in diameter, and the same in depth.

An even more striking instance is a case of chorion-epithelioma, seen in consultation with Dr. Erck and Dr. Levi. A considerable ulcer existed in the vaginal fornix at the site of a hysterectomy, and in the left vaginal sulcus there was a fixed mass the size of a lemon, closely attached to the pelvic wall, and in direct relation with the ureter. In this case, any further attempt at operation was considered most inadvisable, on account of its necessarily radical nature, and the extreme hazards which would attend it, with little or no promise of relief. Radium

was at once applied, and the mass has now shrunk to almost indistinguishable remains. After three days, the bleeding, which had been excessive, ceased, and cannot now be induced, even by rough manipulations. Even though this patient should ultimately succumb from metastasis, which is possible, and indeed probable, the result is nothing less than miraculous. These cases, therefore, indicate the value of radium, even in apparently hopeless conditions, and it behooves us not to look with such extreme skepticism as is prevalent among many upon the results reported by so many competent observers, but to apply this treatment at once in properly selected cases.

I do not wish to be misunderstood as implying that surgical treatment is abrogated in these cases, however. As yet, radium should be utilized in operable cases only as an assurance against recurrence. It must not supercede surgical methods until the data bearing upon its positive value become so convincing that we can no longer feel that we are hazarding the life of the patient by keeping her under this treatment while surgical methods are still possible. One of the advantages claimed for radium is that a preliminary application will limit the growth of a cancer, and stop hemorrhage and foul discharge, thus decreasing the dangers of a radical operation. We know with great accuracy what we may expect from surgical intervention in cases of fibroid tumors, and in the cure of cancer of the uterus. By cautiously advancing from this position, we may add materially to our good results through a judicious selection for the application of the newer remedies of cases which offer a hopeless outlook, or too great hazards from the surgical standpoint. In this way we may safely extend the domain of successful treatment.

**Menstrual Changes Occurring in the Endometrium.** A preliminary report on some very extensive investigations into the important cyclic changes occurring in the endometrium during the period of sexual activity has been published during the past year by Schröder.<sup>1</sup> He says that the main principles laid down in the fundamental work of Hitchmann and Adler<sup>2</sup> have been confirmed by other investigators, and it now remains only to work out some of the details, and to clear up some obscure and apparently contradictory phenomena. A study of over 700 specimens has convinced Schröder of the correctness of ideas which he has formerly expressed concerning the time-relation between menstruation and ovulation; namely, that the young, developing corpus luteum in the ovary corresponds to the early premenstrual stage, or beginning of secretion, in the endometrium; the fully ripened corpus luteum to the fully developed premenstrual swelling of the endometrium; and the retrogression of the corpus luteum to the postmenstrual stage of the endometrium. He prefers to divide the endometrial cycle into three stages, instead of the four of Hitchmann and Adler, and calls

<sup>1</sup> Zentbl. f. Gyn., 1914, xxxviii, p. 1321.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1914, p. 236.



them, (1) the stage of *proliferation*; (2) of *secretion*; and (3) of *desquamation and regeneration*. Since the first evidences of secretion, representing the beginning of the second stage, usually appear about the sixteenth to eighteenth day (counting from the *first day* of the preceding period), it is probable that the actual discharge of the ovum from the Graafian follicle (ovulation) takes place a little earlier, *i. e.*, about the fourteenth to sixteenth day, this calculation being based on a normal, twenty-eight-day menstrual cycle. Ovulation, therefore, probably falls about midway between two menstrual periods.

Microscopically, Schröder finds a very distinct differentiation of the endometrium into a narrow, basal layer, and a much broader, functional layer, the latter alone taking part in the cyclic changes, undergoing desquamation, and becoming regenerated from the basal layer. In the early part of the cycle, *i. e.*, from the first to fifth day, there is practically nothing present but the basal layer, with perhaps some debris from the desquamated remains of the superficial portion; about the fifth or sixth day, however, a distinct regeneration of the latter begins, this proceeding rapidly until about the tenth day, then going on more slowly till about the fifteenth day, by which time the endometrium is fully restored. Now the first secretion begins to form in the glands, this increasing with the well-known tortuosity of the glands, which becomes more and more pronounced, with marked growth of the lining cells, until the twenty-eighth day, when the cycle closes by the entire superficial or functional layer of the endometrium being desquamated and cast off with the menstrual blood. (In this point, Schröder differs quite markedly from the majority of recent observers, most of whom do not believe that there is any massive desquamation of the endometrium.) According to Schröder's reckoning, therefore, the proliferative stage extends from the fifth to the fifteenth day (always, of course, counting from the first day of the menstrual flow), the secretory stage from the fifteenth to twenty-eighth day, and the desquamative and regenerative stage from the first to the fifth day.

While this process is constant for all cases of regular menstruation, the *amount* of proliferation of the endometrium was found to vary considerably within what might be considered normal limits, in some instances the membrane attaining a thickness of only about  $2\frac{1}{2}$  mm., in others of over 4 mm. The degree of tortuosity of the glands, swelling of the lining cells, etc., also varied in different cases, but the cyclic changes themselves were found very resistant to disturbing influences, not being as a rule affected by uterine displacements, tumors, or inflammatory conditions of the adnexa.

With regard to the important and much discussed question of diagnosing from microscopic examination the presence of infection, *i. e.*, *endometritis*, Schröder agrees with the generally accepted modern idea of depending on the demonstration of a round-cell or plasma-cell



infiltration of the stroma. He very properly calls attention to a fact which is apparently often overlooked, namely, that in every normal endometrium there is a scattering infiltration with round cells, a distinct *increase* in which must be demonstrated before we are justified in diagnosing endometritis. In many cases, the basal layer is found to be included in the inflammatory infiltration, this explaining the reinfection of every newly forming functional portion after each menstrual period. Schröder attempts to offer an explanation for the often very puzzling cases of *diffuse hyperplasia* of the endometrium, which in the older nomenclature used to be termed "endometritis polyposa cystica," "endometritis fungosa," or "endometritis glandularis hypertrophica et hyperplastica." We now believe, he says, that these conditions are not associated with true inflammation, and are therefore not to be classed as endometritis at all; in their occurrence the regular menstrual cycle is disturbed, and the most grotesque and abnormal formations are produced, the glands being utterly irregular in type, and many often showing cystic dilatation. The endometrium varies greatly in thickness in different areas, and part of the stroma are often edematous. Schröder has observed that this condition occurs chiefly about the time of puberty or the climacterium, and believes that it is due to a failure on the part of the developing follicle in the ovary to rupture and pass on to normal corpus luteum formation. The *persistent follicle*, he thinks, exerts some abnormal, stimulant action on the uterine mucosa, which results in its abnormal proliferation, the absence of the normal corpus luteum secretion being responsible for the failure of completion of the endometrial cycle through the periods of secretion and desquamation. He was actually able, in 31 such cases, to demonstrate the presence in an ovary of a persistent, unruptured follicle, instead of a corpus luteum.

This explanation appears on the whole quite plausible, and if further investigations shall confirm its accuracy, it will do much to explain these hitherto obscure cases of marked endometrial hypertrophy, unassociated with inflammatory processes or other demonstrable lesions.

**Intra-uterine Medication.** Although it has become the fashion in recent years to frown on the practice of making local applications to the interior of the uterus, both because of the unpleasant consequences which may at times result from this type of therapy, and perhaps also because many cases formerly subjected to it are now treated by the x-rays, there still remain, as Zangemeister<sup>1</sup> points out, cases in which local applications may be of the greatest benefit. As examples of these he mentions, for instance, chronic inflammatory conditions of the endometrium which do not yield to simpler measures, such as douching, and chronic hyperplastic endometritis in young women, in whom we

<sup>1</sup> Ther. Monatsh., 1914, xxviii, p. 170.

do not want to produce a Röntgen castration, nor to jeopardize the possibility of future pregnancy by even short exposures of the ovaries to the  $x$ -rays.

It has been shown by Menge and others that the introduction of even a small quantity of fluid into the uterine cavity by means of the ordinary Braun syringe or cotton-tipped applicators may in occasional instances be followed by a discharge of the fluid through the tubes into the abdominal cavity. Various experiments have shown, however, that this occurs only when the cervical canal is closed and pressure is exerted

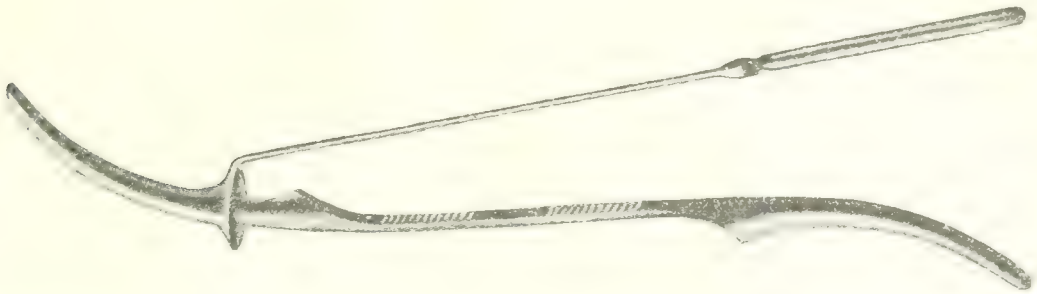


FIG. 81

by the contracting uterus on the contained fluid. In order to apply intra-uterine therapy with safety, therefore, it is necessary to dilate the cervix thoroughly, to maintain it in this condition throughout the treatment, and to remove all superfluous fluid before contraction shall have taken place. Zangemeister says that for this purpose he has been employing the following technique for five years, and has never in this time experienced the slightest unpleasant results:

**TECHNIQUE.** The cervix is gradually dilated with bougies up to the desired point, after which the sound next smaller than the last one used is again introduced, encased in a specially fitted tubular speculum



FIG. 82

(Fig. 81), for which it acts as an obdurator. The dilator is then removed, leaving the speculum in place, where it is held by means of its long handle. It must be of sufficient length to reach above the internal os. The uterine cavity is now gently cleaned by means of dry cotton on an applicator, and then the solution to be employed is introduced through the speculum, either with an applicator or a Braun syringe. All excess of fluid is removed with dry applicators or little strips of gauze while the tube is still in place; this may then be removed, and the cervix allowed to contract, but in cases in which there is apt to be much

secretion, or several treatments may be required, Zangemeister introduces a drainage tube (Fig. 82), constructed apparently somewhat on the principle of the Wylie drain, and allows it to remain in the cervix, thus greatly facilitating subsequent treatments, as repeated dilatations of the cervix are not necessary. The author does not state how long he is willing to leave the drain in place, but presumably until the conclusion of treatment.

**Formalin Treatment of Climacteric Hemorrhage.** An important indication for intra-uterine therapy is believed by Gerstenberg<sup>1</sup> to be the treatment of climacteric hemorrhage, for which purpose he says he has been using concentrated formalin solution for the past fifteen years, with the most satisfactory results. His method is to introduce a fine Playfair sound, wrapped in cotton well soaked in full strength formalin solution, into the uterine cavity under all aseptic conditions, withdrawing it before the cervix has time to contract and grip it, which it will do as a result of the irritation to the uterine wall. After waiting a few minutes for the contraction to pass off, a second application is made in like manner. After thoroughly cleansing the vagina with dry cotton, a tampon is placed against the cervix, to be removed after twelve hours. For the first two days the patient is advised to remain in bed as much as possible, and to take no douches during that time.

Gerstenberg says that he has never seen any bad results from this treatment, such as too extensive destruction of tissue, abdominal cramps, etc., and considers it such a reliable method for the treatment of the so-called "idiopathic" hemorrhages of the climacterium that if two energetic applications do not stop the bleeding, his suspicions are at once aroused that there may be some more serious condition present, such as carcinoma, or a submucous fibroid, requiring further investigation.

**Treatment of Leucorrhea.** According to Oppenheim<sup>2</sup> the best treatment for non-specific leucorrheal discharge, which is merely the result of a catarrh of the vaginal or uterine mucosa, is to secure an astringent and antiseptic action upon the diseased mucous surfaces, for which purpose any actively hygroscopic powder, mixed with an efficient bactericide, will suffice if it can be brought into direct contact with the mucosa. This is easy of accomplishment so far as the vagina and vaginal portion of the cervix are concerned, but presents difficulties when the cervical canal or uterine cavity are involved, so that in the latter regions local applications usually have to be resorted to.

A large number of powders have been used in the treatment of leucorrhea, bolus alba being perhaps the most commonly employed. Oppenheim has found, however, that ordinary talcum is the most satisfactory, since it combines to great advantage the properties of easy distribution

<sup>1</sup> Zentbl. f. Gyn., 1914, xxxviii, p. 1201.

<sup>2</sup> Berl. klin. Woch., 1914, li, p. 604.



and absorptiveness, and does not tend to cake or clump when moistened by the discharge. For the bactericidal element, he uses iodine preparations, and has now come to depend entirely upon "yatren," an iodine-benzol derivative, an odorless, yellowish powder, having an iodine content of 30 per cent., but entirely free from irritating properties, even when used continuously over long periods. With this yatren-talcum mixture (10 per cent. yatren) the author has treated a large number of leucorrhea cases with most satisfactory results. He says that within one to three or four weeks, according to the severity of the case, the discharge usually begins markedly to diminish, and before long disappears entirely. The only completely refractory patients he encountered were those with definite lesions of the upper genital

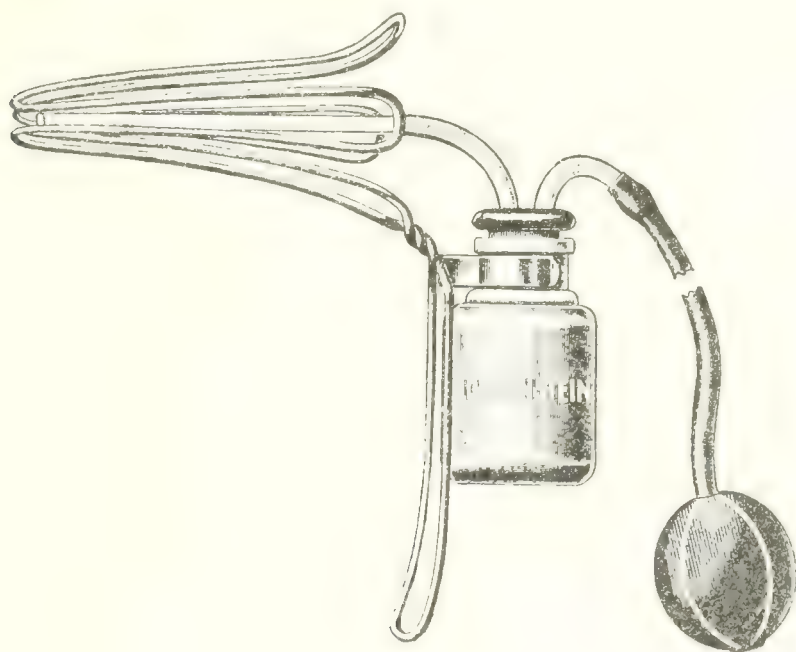


FIG. 83

tract, or with constitutional conditions as the main factor in producing the discharge. No cases of gonorrhea or of inoperable carcinoma were treated.

Oppenheim thinks the treatment should always be given by the physician, and not left to the patient herself, as it is practically impossible for her to secure proper distribution of the powder, without which the procedure is valueless. At first applications are made once, or in bad cases even twice daily; later every other day suffices. The patient is instructed to take a douche once a week, but not oftener. For introducing the powder, the author has devised a very simple apparatus, (Fig. 83), consisting simply of a combination of a wire vaginal speculum with an insufflator such as is used in nose and throat work. The speculum should be made fairly wide, and of good springy wire, so

that when inserted deep into the vagina the pressure of the vulvar ring on the outer end will cause the apex to open up somewhat, and thus thoroughly expose the vaginal fornices. The speculum is then gradually withdrawn as pressure is made on the bulb of the insufflator, all portions of the vaginal mucosa being thus covered evenly with the powder.

**Dilatation of the Cervix under Local Anesthesia.** A novel method of securing local anesthesia of the cervix for the performance of curettage and other minor procedures about the uterus has been devised by Kraus,<sup>1</sup> on the principle of the pressure anesthesia extensively employed in dentistry. It has been found, for instance, that if a pledget of cotton, soaked in an anodyne solution, is forcibly rammed into a tooth cavity, and allowed to remain for a few moments, subsequent boring, etc., can be carried out for some time without pain. In adapting this principle to gynecologic use, Kraus attempted various ways of forcing local anesthetics into the uterus, especially the cervix, for it is the dilatation of this that causes practically all the pain associated with curettage, and has finally adopted the following method:

The dilatation is performed, as is universally the practice in Germany, by means of graduated Hegar bougies. These are previously prepared by being dipped, after sterilization, in a hot solution of 5 gm. novocain and 0.15 mg. suprarenin to 100 gm. simple syrup, which has been boiled until it is ready to sugar. On cooling, the bougies are thus coated with a thin glaze of sugar, incorporated in which is a certain amount of the anesthetic. They are introduced in the usual manner, starting with the smallest, but each is allowed to remain in the cervical canal long enough for the coating partially to melt; the anesthetic is thus forcibly pressed into the cervical wall, and the entire operation can be performed practically without pain, the only slight disadvantage being that the time necessary to obtain dilatation is somewhat increased, owing to the necessity for leaving each bougie in place long enough for the anesthetic action to occur. Kraus says that he has performed 24 curettements in this manner, with good results both in nulliparous and multiparous individuals.

**Parametric Anesthesia for Vaginal Operations upon the Uterus.** Two years ago we reviewed an article by Ruge,<sup>2</sup> in which he described a method of performing vaginal hysterectomy under local anesthesia, induced by injecting a solution of novocain and adrenalin into the parametric tissue on each side, thus blocking the main nerve trunks. At that time, Ruge was able to report only two operations performed in this manner, but in a more recent paper<sup>3</sup> he says that he has now done altogether 22, of which 19 were vaginal hysterectomies for cancer, metropathic hemorrhage, or myoma, and 3 vaginofixations for adherent

<sup>1</sup> Münch. med. Woch., 1914, lxi, p. 1515.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1913, p. 284.

Münch. med. Woch., 1914, lxi, p. 2401.

retroversion. In 14 of the patients the anesthetic effect is described as "absolute," and in 6 as not complete, but sufficient without the use of general narcosis. In one instance it failed entirely, and ether had to be resorted to. The technique employed is practically the same as that described in the former paper, a long, thin needle being introduced for several centimeters into the tissue on one side of the cervix, a syringe attached, and from 6 to 15 c.c. of a 1 to 2 per cent. solution of novocain, containing 5 drops of 1 to 1000 adrenalin solution to each 100 c.c., slowly injected as the needle is withdrawn. The same procedure is then repeated on the opposite side. The author has found the additional injections in front of and behind the cervix not absolutely necessary, but of advantage if it is desired to save time, as the operation may then be begun in fifteen minutes, otherwise a wait of about twenty-five minutes being usually necessary. In operating with this anesthesia, it must be remembered that the clitoris and external genitalia retain their full degree of sensibility, so that care must be taken not to press too hard with instruments against these parts. The only previous preparation given the patients is a dose of veronal the night before, and a hypodermic injection of 0.01 gm. morphine one hour before operation. They receive their ordinary breakfast in the morning.

Ruge considers this type of anesthesia of the greatest value in operations upon old or cachectic individuals, who would not well stand etherization for an hour to an hour and a half in addition to the shock of operation. He says that he only lost one of his patients, but he is sure that, considering the character of cases comprised by the series, his mortality would have been much higher had any form of general narcosis been used. He does not especially advise the parametric anesthesia in patients in whom there appears to be no contraindication to ether, and distinctly warns against it in the presence of inflammatory infiltration of the parametrium.

**Retroversion of the Uterus.** Reynolds<sup>1</sup> says that long and careful observation has convinced him that most cases of retrodisplacement of the uterus are associated with an abnormal forward fixation of the cervix, this being the only portion of the organ which is attached to bony structures, or to the firm connective tissues over them, by inelastic connective tissue. This attachment is furnished by the extremely strong and unyielding anterior vaginal wall, with its firm attachments to the pubic arch, and the median Y-shaped ligament or fascial sheet, first described by Goffe, which extends from the cervico-vaginal attachment to the connective tissue above the pubic arch on each side of the urethra. In cases of so-called hypoplasia, or underdevelopment of the genital organs, which is frequently encountered in mild degrees, the arrest of development is never confined to the cervix alone, but neces-

<sup>1</sup> Surgery, Gynecology, and Obstetrics, 1914, xix, p. 588.



sarily includes a short anterior wall as well, *i. e.*, an underdevelopment of this firm structure and of Goffe's ligament. This shortened attachment then holds the *vaginal* portion of the anteflexed cervix firmly forward, while the *supravaginal* cervix is drawn backward by the sacro-uterine ligaments. The *fundus*, again, is held forward by the scattered muscle fibers in the broad ligaments, and by the occasional action of the round ligaments, thus producing the characteristic condition of "acute anteflexion" seen in these cases. With the onset of menstrual congestion, however, the uterine walls become engorged, and the organ tends to resume its normal shape, *i. e.*, to efface the angulation. The cervix being fixed forward, any relaxation of the muscular action of the round and broad ligaments permits the fundus to move backward in some degree, sufficiently it may be to receive the effect of general intra-abdominal pressure on its anterior face, this tending of course to force it still further back, and thus the process of retroversion is started.

The diagnosis of this forward fixation can be made, Reynolds thinks, only from experience in judging of the mobility of the cervix, as ascertained by attempting to move it upward and backward with the finger or with a double hook. A short series of observations on women, some of whom have, and some of whom have not, the abnormality commonly called anteflexion, will usually be sufficient to establish a standard in one's mind of the normal degree of mobility of the cervix.

As a result of these observations, Reynolds has devised a method of relieving the abnormally close attachment of the cervix under the symphysis, a step which he considers of considerable importance in the treatment of retrodisplacements of this type. His present technique, which he believes to be a distinct improvement on that which he described a few years ago,<sup>1</sup> is as follows: "After a preliminary dilatation and curettage, the vaginal wall is seized with forceps immediately in front of the cervix and divided with scissors throughout its thickness, a narrow transverse strip being removed. The length of this transverse incision must vary somewhat with the size of the individual vagina, but it should ordinarily be just sufficient to admit the operator's index finger. The anterior lip of the cervix is then seized with volsellum forceps, one blade of which enters the vaginal wound, while the other lies within the cervical canal. Traction downward and backward brings Goffe's ligament into view. This also is divided transversely with scissors over the whole width of the transverse wound, so exposing the loose connective tissue between the cervix and the bladder. All tissues in front of the cervix are then separated from it with the index finger passed through the wound up to or slightly above the level of the internal os, and as far out on each side as the finger can conveniently

<sup>1</sup> Surgery, Gynecology, and Obstetrics, 1911, xiii, p. 17.

reach, thus freeing the anterior surface of the broad ligaments, as well as the cervix. The transverse wound in the vagina is then brought together by a transverse running suture, thus elongating the anterior vaginal wall. During the first stage of this little operation there is frequently free bleeding, but it comes only from the cut edges of the vaginal wall, and if the division of the deeper tissues is done with the finger all bleeding will be controlled by the sutures. At the conclusion of this stage of the operation the cervix will be found to have become freely movable, and to have receded into the posterior cul-de-sac, but since it is still crooked and the os still looks forward it is well in most cases to complete the operation by a discission of the posterior lip. After the recovery of the patient from ether, the lower pole of the uterus will now be drawn strongly backward and upward by the unopposed action of the uterosacrals, and the application of a suspension, or of any of the standard round ligament operations to the upper pole completes the operation. There is now everything to keep the fundus forward, and no opposing force to turn it backward."

Reynolds says that since adopting this procedure his failures after operations for retrodisplacement have disappeared almost to the vanishing point, and he has come to feel that with this addition almost any one of the accepted operations is as good as any other.

**Pros and Cons of the Stem Pessary.** Every now and then there crops out in the literature a certain amount of discussion as to the propriety of introducing into the uterine cavity any type of stem or tube of hard substance, to be left there for some weeks or months. At one time freely used, then almost universally condemned, this little instrument appears at present to claim among the ranks of European and American gynecologists both earnest adherents and bitter enemies, if we can judge by a number of articles which have been running through the German journals during the past year, and by the lively discussion that was aroused at a recent meeting of the Philadelphia Obstetrical Society by the presentation of a paper upon the subject.

Rieck<sup>1</sup> says that he is a strong believer in the intra-uterine pessary for the treatment of certain cases of scantiness or complete absence of the menstrual flow, especially if associated with dysmenorrhea, and reports a series of 22 such cases in which he has used the instrument, in most of these patients various other measures having previously been tried, such as hot douches, ovarian preparations, massage, and puncture of the portio vaginalis, but without result. Ten of the patients had complete amenorrhea, the others scanty and irregular menses, with abdominal cramps, headache, and in some instances, epileptiform convulsions. Rieck admits having had 6 failures, 3 in each class of cases, but claims a complete and lasting cure in all the others. He used an

<sup>1</sup> Zentbl. f. Gyn., 1914, xxxviii, p. 1061.

aluminum stem, upon the details of whose construction he lays considerable stress: it must be of such size that it will be firmly gripped by the uterus, thus moving as one piece with that organ, and not wiggling about in the cervical canal. The head, which lies in the fundal portion of the uterus, must be considerably larger than the stem, which lies in the cervical canal, so that considerable resistance has to be overcome in pulling the instrument out. Contrary to our general usage, Rieck does not advocate a long, slow, powerful dilatation of the cervical canal, but says that this should only be stretched barely enough to permit the head of the pessary to be pushed through, so that this will then be gripped tightly and held in place by the uterine muscle without stitches, and without the necessity for a large disk-like lower extremity to press upon the vaginal mucosa. He has not found any advantage in having the pessary perforated by a canal.

The author says he has had no trouble from infection or irritation following the use of the pessary. In one case he had to remove it in two weeks on account of cramps, but in most of the others he left it in place for many weeks or months. He says that this is absolutely necessary for the production of a satisfactory result, and now tries to keep every pessary that he inserts in place for eight months to a year; in two of his cases the instruments remained for six and eight years respectively, as the patients felt perfectly well, and had disappeared from view. The only bad results that he records are an abortion occurring in one of these women, a slight injury to the vaginal mucosa produced by the lower end of the pessary in a young girl with a very narrow vagina, and some pain in one instance, as stated above, necessitating removal of the stem. He says that he has never seen so much as an endometritis follow the proper use of the instrument, and thinks its introduction is considerably less serious than the performance of a simple curettement.

Opitz<sup>1</sup> says that he likewise was for many years a believer in the harmlessness of the intra-uterine stem, but that two cases which recently occurred in his practice almost simultaneously have rudely shaken this feeling of security. The first of these was a woman, aged thirty-nine years, upon whom a laparotomy was performed for a subserous fibroid, with adhesions about the sigmoid and cecum. For the relief of sterility, the cervical canal was dilated at the same time, and an intra-uterine pessary inserted. Convalescence was normal, but two months later the patient returned with a good-sized inflammatory mass involving the left adnexa, which required many weeks of conservative treatment for its relief.

In the second case, a dilatation of the cervical canal, with a discission operation, and insertion of a stem pessary was followed by a laparotomy

<sup>1</sup> Zentbl. f. Gyn., 1914, xxxviii, p. 1233.



for ventro-suspension of the retroverted uterus and removal of a small parovarian cyst. Within a month this patient developed fever, cystitis, and signs of infiltration in the right parametrium. These symptoms were said to have come on upon resuming sexual relations after leaving the hospital. The pessary was removed, and the condition improved temporarily, but soon signs of general peritonitis became manifest, with tenderness in the gall-bladder region and slight icterus, suggesting an acute cholecystitis and cholangitis. Notwithstanding immediate laparotomy, the patient died, this unfortunate result being laid by Opitz directly upon the use of the stem pessary. As a result of these experiences, he says he will never use the uterine stem again, and advises all other gynecologists to adopt a similar attitude.

These two cases are typical of many in which the use of a stem pessary is held responsible for subsequently occurring conditions, of which it may or may not have been the true cause. Neither were entirely uncomplicated cases of cervical stenosis, and in both the introduction of the pessary was combined with the performance of a major abdominal operation. In the first, the use of a stem was clearly contraindicated by the presence of the fibroid tumor and pelvic adhesions, showing that there had been at some time an inflammatory process in that region. In the second instance the case against the stem seems a little more clear, but absolutely nothing is said by the author as to the findings in the pelvis at the second laparotomy, nor as to whether an autopsy was performed, so that we must merely take his word for it that the fatal outcome was in fact attributable to its use.

Following the appearance of these papers, A. Martin<sup>1</sup> published a résumé of his experiences with the stem pessary, these reaching back to 1868, at which time he says he first saw this instrument used. He does not believe that injury will result from its careful and proper use, but thinks that most of the failures reported are due to poor technique, or to faulty judgment in the selection of cases. He says that so strict has he been with regard to the latter point that he thinks he has used this treatment in only about 80 cases in the past forty-two years, but when it is indicated, he considers it one of the most valuable of our resources. Martin's chief indication for the use of the stem is amenorrhea or oligomenorrhea, especially when associated with an infantile uterus; strangely enough, he has had practically no experience with it in the treatment of dysmenorrhea. His technique and after-treatment appear to differ radically from ours, since he introduces the stem in his office, without previous dilatation of the cervix, and without other anesthesia than local applications to the uterine mucosa. If there is no pain after a few minutes, the patient is allowed to return home. She is advised to take cleansing douches—a procedure which we consider

<sup>1</sup> *Monatschr. f. Geb. u. Gyn.*, 1914, xl, p. 665.

most inadvisable—but to refrain from all sexual relations as long as the pessary is in place. For the first few days the patient is kept under careful observation; if the first following menstruation is passed without discomfort, two or three months are allowed to pass without further examination, at the end of which time the pessary is removed. Martin says that he uses it only in private practice, but never in dispensary patients, owing to the difficulty of keeping them under control.

In a recent meeting of the Philadelphia Obstetrical Society, Nicholson<sup>1</sup> brought up the question of the stem pessary by reporting the following case: The patient was a healthy woman, married for some years, and complaining of dysmenorrhea and sterility. The husband was examined by a competent genito-urinary surgeon, and found entirely healthy. Examination of the patient under ether revealed a small, mobile, acutely anteфлекed uterus, without the slightest indication of pelvic inflammation. In view of these findings the cervix was dilated, a light curettement performed, and a stem pessary introduced, a Smith-Hodge pessary being also used to keep the cervix well back, and thus hold the stem in place without the use of sutures. The convalescence was uneventful, and in two weeks the patient left the hospital. A week later, however, she suddenly developed severe pain in the lower right quadrant of the abdomen, with a temperature of 103°, and chilly feelings, but no actual rigor. Examination at this time showed great tenderness of the uterine body and right vaginal fornix. The patient stated that since leaving the hospital she had taken daily douches of tap water, and had had intercourse once. The stem was removed, and under conservative treatment the acute condition subsided; following this there was a profuse, dark colored discharge for several weeks, when another flare-up occurred, this time with pain extending over to the left side as well. Eventually abdominal section, with removal of the greater portion of the adnexa, became necessary, the tubes being found occluded and bound down by adhesions; there was no pus, however.

Nicholson believes that in this case he can eliminate, as far as it is humanly possible to do so, any cause for the development of infection other than the drain, and states that while he does not intend to abandon its use entirely as a result of this single experience, he does wish to bring before the profession the dangers that may be associated with it. In order to determine if others have had similar experiences, he instituted inquiries among a number of his colleagues, as a result of which he was able to learn of about 400 cases in which some type of intra-uterine stem had been used for the treatment of dysmenorrhea or sterility. In this series there were 12 known instances of subsequent infection; in 4 of these it was so slight as to be of no significance, but in the remaining 8 a mutilating operation eventually became necessary for

<sup>1</sup> American Journal of Obstetrics, 1914, lxx, p. 608.



the relief of pathological conditions presumably produced by the stem. The author thinks that this number is a distinctly conservative estimate, as there may have been other patients who had trouble following the operation, but who never returned to the surgeon who originally treated them.

The lively discussion<sup>1</sup> which followed the presentation of this paper brought out some decided difference of opinion among the members of the society. Hirst stated that because of two cases of infection which he saw several years ago following the use of the Wiley drain, he has given up this type of instrument entirely in favor of the metranoliter, a strong spring dilator, which is left in the cervical canal for only twenty-four hours. R. C. Norris, on the other hand, said that he has thus far had no accidents from the stem pessary, and although recognizing its potential dangers, feels that the good results he has obtained with it are sufficient to warrant its further use. He called attention to one point not emphasized by the reader of the paper, namely, that at least 25 per cent. of the patients had been relieved of their dysmenorrhea. Boyd said that he has used the Wylie drain for some years, and has had no trouble, while Shoemaker reported having seen two cases of salpingitis after its use by others.

My own feeling in the matter is that, if used with proper precautions, the Wylie drain, or some similar type of stem pessary, is such an exceedingly useful little instrument in suitable cases, and that its use is accompanied by such a small amount of risk, that I should be most reluctant to abandon it. If we were to cast aside every surgical measure in which an occasional bad result occurs, there is not an operation that would stand the test. On the other hand, the technique employed by the writer of the paper is open to criticism, in that the patient was not warned to avoid douching while the drain was in place. This is an exceedingly important point, for with a narrow, nulliparous vagina, and the patulous condition of the cervix maintained by the instrument, it is easy to see how douche water could easily be carried up into the interior of the uterus, bearing with it infectious organisms. Moreover, in a number of the cases cited by Nicholson, and brought up by others in the discussion, the data are so incomplete, or the time elapsing between the use of the drain and the development of the infection was so long (in one instance two years), that the direct etiologic connection appears far from demonstrated. As C. C. Norris<sup>2</sup> pointed out in the discussion, and also in a paper published a few years ago, the Wylie drain has been for several years employed routinely in properly selected cases by all the members of the gynecologic staff of the University of Pennsylvania, none of whom have ever seen any unfavorable results from its use. There can be no doubt that it has given us better results than any other

<sup>1</sup> *American Journal of Obstetrics*, 1911, p. 651.

<sup>2</sup> *PROGRESSIVE MEDICINE*, June, 1913, p. 282.



method employed for the treatment of sterility, and we believe that if we put before the average woman, who is sterile and anxious for children, the series of cases in which the condition has been overcome by the use of the drain, and, on the other hand, its possible dangers as brought out by Nicholson's paper and the discussion, probably but an occasional patient would be deterred from having the operation performed.

**Innervation of the Uterus and Vagina.** This subject, which is as yet but very imperfectly understood, has been studied from the physiologic point of view by Falk,<sup>1</sup> by means of experiments on rabbits and dogs. Stimulation of the peripheral end of the hypogastric, pelvic, and internal spermatic, as well as of the vagus and phrenic nerves, was found to cause contractions of the uterus and vagina, probably due in all instances to the sympathetic fibers present. No contractions were caused when the aorta or inferior vena cava were ligated, but stimulation of the nerve network of the aorta did cause contractions. In all experiments, the puerperal or gravid uterus reacted much more strongly than the virgin. Stimulation of the cerebral cortex, pons, cerebellum, etc., was found to cause as strong contractions as stimulation of the lumbar cord, wherefore the author believes that no special centre exists in the latter region governing movements of the uterus, but assumes that there are several centres, one of which is probably situated in the medulla, since very slight irritation of this causes uterine contractions. Even after complete separation from the nervous system by section of all its nerves, the uterus can still contract, however; so it seems probable that the central nervous system has only a regulating effect.

**Sudden Relaxation of the Uterus During Curettage.** Four cases of a most unusual condition, but one which might easily lead to the performance of an unnecessary laparotomy from suspicion of a perforation of the uterus, are reported by Markoff.<sup>2</sup> In each of these patients a curettement was being performed without anesthesia when the uterine wall, which had been offering normal resistance, suddenly became no longer palpable, due to acute dilatation. None of the women showed any subjective symptoms, such as collapse, or altered pulse or respiration, and in each instance the uterus contracted again after douching with a hot iodine solution. The cause of this sudden relaxation the author believes to be organic or functional insufficiency of the uterine muscles, predisposing factors to which are probably subinvolution, hypoplasia, metritis, anemia, and degenerative changes in the ovaries. While he is by no means clear as to the mechanism of the dilatation, he is sure that neither the introduction of a foreign body, nor stimulation of the uterine ganglia, can be held responsible. The importance of the con-

<sup>1</sup> Dissertation, Moscow, 1914; International Abstract of Surgery, August, 1914, p. 169.

<sup>2</sup> Iswest. Nikolaj. Univ. Saratowe, 1913, iv, p. 239; Internat. Abstr. Surg., October, 1914, p. 402.

dition is, of course, that it may easily be mistaken for a perforation, but the fairly prompt reestablishment of contractions is sufficient, he thinks, to differentiate it from this latter accident. When such relaxation does take place, he advises removing all instruments from the uterine cavity, as when contractions take place, perforation may otherwise result.

### THE FALLOPIAN TUBES.

**Recurrence of Tubal Pregnancy.** It is often an exceedingly puzzling problem to know what to do with the *uninvolved* tube in dealing by abdominal section with a case of tubal pregnancy. If it is removed, the woman is permanently sterilized; if it is left, and is patulous, she may subsequently have normal pregnancies, but on the other hand, she may again be subjected to the grave dangers of an ectopic gestation. In order to determine if possible the relative chances for the occurrence of these two eventualities, R. R. Smith<sup>1</sup> instituted a series of inquiries among American surgeons as to the subsequent results in their operated cases of tubal pregnancy. He obtained replies from about 40 men, and was able to gather records of 192 patients who had been followed for *five years* or more since operation; this arbitrary period was chosen as being long enough to give a fairly accurate estimate of ultimate results, while had a much longer interval been demanded, it would have been almost impossible to gather enough cases to be of statistical value.

Of the 192 patients, 48 had such operations as hysterectomy, or bilateral salpingectomy, which rendered the occurrence of subsequent pregnancy impossible, and are therefore not available for the purposes of the investigation. This leaves 144 women who were operated on for tubal pregnancy, in whom the uninvolved tube and the uterus were not removed, and in whom, therefore, subsequent conception appeared at least theoretically possible. Of these, 47, or just about a third, had uterine pregnancies at some period following the operation, some of them more than one, with the resulting birth of 64 living children, besides several still-births and abortions. A second ectopic gestation occurred in somewhat less than half this number, or twenty-one times; in two instances, a normal pregnancy, resulting in the birth of a living child, was subsequently followed by a second ectopic. It appears, therefore, that about 38 per cent. of such cases bear children subsequently, and about 15 per cent. repeat their tubal pregnancy.

In view of these results, Smith asks, "Is it best always to save the opposite tube when it seems capable of transmitting the ovum?" His reply is that each man must answer for himself, according to his convictions on the matter of preserving the child-bearing function, and the

<sup>1</sup> Surgery, Gynecology, and Obstetrics, 1914, xviii, p. 684.

seriousness which he attaches to the occurrence of a second ectopic pregnancy. For his own part, the author indicates that he bases his judgment to a large extent upon the age of the patient, and also to a certain, but limited extent upon her own wishes, after free discussion of the matter with her. He thinks we should apply to these cases the general principles which have been adopted in the treatment of other pelvic lesions, namely, a marked conservatism in younger patients and a more radical procedure in the older ones, in whom the need for further offspring is no longer so urgent. Such considerations, then, as the patient's age, the number of children she has borne, her general health, and her own desires, are in his opinion of far more weight in each individual case than the gross appearance of the uninvolved tube at the time of operation, from which he thinks but little can be prognosticated as to its subsequent behavior.

**Coincident Tuberculosis and Carcinoma of the Fallopian Tube.** Although primary carcinoma of the Fallopian tube is to be rated distinctly among the rarer tumors, a not inconsiderable proportion of the cases that have been studied have been found associated with tuberculosis, so that v. Franqué<sup>1</sup> and others have strongly advocated the theory of a possible causal relationship between the two conditions, assuming that the rather profuse epithelial proliferation which is commonly a marked feature of tubal tuberculosis may go over into a state of true malignancy, or that at least the tissue-injury caused by the tuberculous process paves the way for the subsequent development of a carcinoma. A rather interesting case in which this combination of lesions was present has been reported by Lipschitz.<sup>2</sup> The patient was forty-four years of age, a nullipara, whose chief complaints were backache, bearing-down, and occasional severe pains in the lower abdomen. At operation a small, multinodular, myomatous uterus was removed with both adnexa, a portion of the left ovary being left *in situ*. One tube was entirely normal, but the other was considerably thickened, especially near the outer end. Microscopically, sections through various portions of this tube showed typical tubercles, with giant cells and considerable round-cell infiltration. In some areas the mucosa appeared normal, in others it showed slightly atypical proliferation, but in sections through a little tumor the size of a hazelnut, which was intimately attached to the outer end of the tube, a distinct picture of carcinoma was presented, with, however, numerous tubercles throughout the markedly inflammatory stroma. The carcinoma was a richly papillary type of growth, apparently originating from the tubal mucosa, with secondary invasion of the underlying musculature. The author thinks that in this case the tuberculosis was undoubtedly the earlier lesion, and that the carcinoma was truly primary in the tube, since no point of origin could be found

<sup>1</sup> Ztschr. f. Geb. u. Gyn., 1911, lxix, p. 409.

<sup>2</sup> Monatsschr. f. Geb. u. Gyn., 1914, xxxix, p. 33.



in the other organs removed; he does not commit himself, however, as to the possibility of an etiologic relation between them.

In conjunction with the report of this case, Lipschitz has collected from the literature records of 144 cases of primary carcinoma of the Fallopian tube. In only 20 of these patients were signs of cachexia present, an interesting point, as showing to what a degree this type of growth remains localized. In 40 cases metastases had taken place, and in 41 recurrences took place after operation, these two latter groups being in part, but not completely identical. Notwithstanding this apparent tendency to remain well localized, primary tubal carcinoma gives a distinctly bad prognosis, for the author was able to find in the entire series only 4 cases definitely well five years after operation. He advocates strongly, therefore, the earliest and most radical operation possible.

**Benign Tumor of the Tube as Possible Cause of Tubal Pregnancy.** If primary cancers of the tube are to be classed as distinctly uncommon growths, primary benign tumors are even more so. A unique growth of this type, of some interest because of its possible etiologic relation to a coexisting tubal pregnancy, has been reported by Outerbridge.<sup>1</sup> The patient, aged thirty-one years, was operated upon for a left tubal pregnancy, the tube and a portion of the ovary being removed. On examination of the tube, a typical gestation sac, with small embryo, was found in the central portion; just proximal to this the lumen was practically occluded by a small polypoid growth, consisting of somewhat degenerated fibrous tissue, and containing a small island of typical hyaline cartilage. The author terms the growth a "polypoid chondro-fibroma," considering it to be a primary fibroma, with cartilaginous metaplasia in one portion. The external surface of the tumor was covered with cylindrical epithelium, similar to that lining the tube, and the tumor plugged the lumen exactly as would a somewhat loosely fitting cork the neck of a bottle. This fact, and the location of the growth just proximal to the site of the gestation sac, suggested the possibility that the arrest of the impregnated ovum at that point, and hence the tubal nidation, had been due to this partial occlusion of the lumen of the tube by the tumor.

**Calcium Treatment for Pelvic Inflammation.** On account of the well-known action of calcium in reducing inflammation in other parts of the body, Landsberg<sup>2</sup> has tried it in treating pelvic inflammatory conditions. For this purpose he uses subcutaneous injections of a 1 per cent. solution of calcium lactate, giving a total dose of about 10 c.c., but dividing this over three or four different points of injection, since considerable skin irritation is apt to occur if more than 2 or 3 c.c. are given at any one point. This procedure he repeats every second or third day. Landsberg

<sup>1</sup> American Journal of Obstetrics, 1914, lxx, p. 173.

<sup>2</sup> Ther. Monatshefte, 1914, xxviii, p. 345.

says that he has treated 18 patients in this manner, 10 of whom had large adnexal masses, with symptoms suggestive of acute peritoneal irritation. Six of these were discharged apparently cured, no enlargement of the adnexa being longer demonstrable by palpation; in 3 others all symptoms disappeared, but some thickening of the tubes persisted, while one case of extensive exudate in Douglas' pouch showed no improvement. Of the remaining 8 cases, 2 came to operation, and the other 6, which showed signs of fairly acute perimetritis or pelvic peritonitis, but without adnexal masses, all responded exceedingly well.

**Pyosalpinx Developing After Intra-uterine Douche.** A case of interest as showing how acutely a pyosalpinx may develop to the point where life is threatened is reported by Schickele.<sup>1</sup> The patient, a previously healthy nullipara, aged twenty years, was brought to the hospital presenting all the signs of acute peritonitis. The history given was that eight days previously the patient had given herself a douche of soapsuds, presumably injecting the fluid into the uterus, to ward off the possibility of pregnancy. Almost immediately after this she had been seized with violent abdominal pain, accompanied by fever and vomiting. For two days before admission catheterization had been necessary, as the patient was unable to void. Immediate laparotomy revealed quantities of free pus in the abdomen, with intense injection and distention of the intestines. A large pyosalpinx was found on the left side, with a smaller one on the right; in the former was a good sized perforation, from which pus was escaping. No trace of injury could be found in the uterus, or in Douglas' pouch. After removal of both tubes, and free vaginal drainage, the patient eventually recovered. Hemolytic streptococci were obtained from the pus and from the tubes. In this case the pyosalpinx had certainly developed within a week, and the perforation had apparently taken place the day before the patient was brought to the hospital.

**Tuberculosis of the Female Genitalia in Childhood.** An extensive addition to our rather scanty knowledge of tuberculous involvement of the female genital organs before puberty has been made by Graefe,<sup>2</sup> who reports the findings in 19 autopsies upon infants and children ranging in age from nine months up to fifteen years. This material represents an observation of fifteen years at the St. Georg Hospital at Hamburg, and amounts to about 20 per cent. of *all* cases coming to autopsy within that time in which tuberculosis of the female genitalia was found. Dividing the cases by age into five-year periods, the greatest number (9) occurred from the first to the fifth year, and the next greatest number (7) from the tenth to the fifteenth year; this marked increase after the tenth year of life is believed by the author to be due to the development taking place in the genital organs at that time, with the consequent increase in blood supply.

Monatschr. f. Geb. u. Gyn., 1914, xxxix, p. 721.

<sup>1</sup> Ibid., xl, p. 448.

As is the case in adults, the organs most commonly affected were the tubes, as is shown by the following table of distribution of the lesions:

Both tubes alone . . . . .	2 times
One tube alone . . . . .	3 times
Uterus and both tubes . . . . .	14 times
Both ovaries . . . . .	3 times
Uterus, both tubes and ovaries . . . . .	3 times
Vagina . . . . .	1 time

In no instance was there involvement of the uterus or cervix without that of the tubes as well, and in no instance were the vulva or clitoris affected. This predilection on the part of the tubes is probably to be explained, the author thinks, by their anatomic structure, the numerous folds and pockets in the mucous membrane offering to the tubercle bacilli thrown off from the blood into the lumen a far better resting place than the smooth endometrium of the infantile uterus. In one instance the tubal infection was in the very earliest stage, merely the mucosa of the abdominal end of one tube being involved secondary to a tuberculous peritonitis, but in the majority the process was more advanced, with distinct caseation, although bacilli could be demonstrated only sparingly. Grossly, the same changes as are found in tuberculous tubes of adults, such as tortuosity and localized swellings, were seen in these specimens. All these changes, however, were confined exclusively to the abdominal ends, the proximal portions of the tubes being in all instances practically uninvolved, a difference which again is probably referable to the anatomic structure. The fimbria were, however, for the most part free, obliteration of the abdominal ostium being present in only one case, although in one other the ends of the two tubes were adherent to each other. The difference in this respect from the usual findings in adults is explained by the author on the ground that in the latter, inflammatory conditions are frequently present in the tube, in addition to the tuberculosis, whereas in children these are entirely absent. In advanced cases, the musculature of the tubes was extensively destroyed, the process reaching to the serosa, and in some instances extensive adhesions existed between the tubes and surrounding structures.

Involvement of the uterus was confined for the most part to the endometrium, the musculature of the uterus being apparently much more resistant than is that of the tubes; the uterine serosa, on the other hand, was frequently affected, containing numerous tubercles and areas of inflammatory thickening, with adhesions to adjacent organs. The uterus, even when involved, was never markedly enlarged, and in no instance was a tuberculous pyometra encountered. The uterine involvement was limited in all the author's cases to the fundal portion.



In every one of the 19 cases, tuberculous foci were found in some other part of the body, as well as in the genital system. In all cases but one the peritoneum was involved; and in a large number, lymph nodes as well, while in scattering cases one or more of the following organs were also affected: lungs, intestines, spleen, liver, urinary organs, pleura, osseous system, meninges, brain, spinal cord, endocardium, thyroid. General miliary tuberculosis was found only three times. Since in practically every instance, the extra-genital foci appeared the older, the author believes the genital involvement to have been invariably secondary; in fact, he was not able to find recorded in the literature a single case of demonstrated primary tuberculosis of the internal genital organs in a child, although he believes that primary involvement of the vulva or vagina from external sources may be possible. Graefe considers hematogenous infection the commonest, although the lymphatics and direct extension have to be considered in some instances. He believes that in most instances the peritoneal tuberculosis was secondary to the tubal, although this point is frequently very difficult to determine. No particular characteristics could be discovered that might be considered predisposing factors for involvement of the genital organs in the tuberculous process, and in no instance had the presence of such involvement been diagnosed clinically.

### THE OVARIES.

**Nerve Supply of the Ovaries.** The results of very painstaking and extended histologic studies upon the distribution of nerve fibers throughout these organs are detailed in a lengthy communication from Wallart.<sup>1</sup> The material employed comprised human ovaries removed at operation, organs from cattle, sheep, and hogs, obtained at the slaughter-house, and those from the ordinary laboratory and domestic animals, such as rabbits, guinea-pigs, cats, and dogs. The problems of technique were numerous and difficult, and even after many years of investigation the author says that the available methods for the demonstration of nerve fibrils leave much to be desired. An important point was found to be the obtaining of the tissue as fresh as possible; if it could not be placed immediately in the fixing solution, it was placed in normal salt at body temperature, and transported in this to the laboratory. The technique of the various staining methods used is given in great detail; the two which in the long run proved the most satisfactory were methylene blue, applied in a special manner, and a modification of the Golgi and Ramón y Cajal silver impregnation, following preliminary treatment in osmic acid. The various gold methods proved very unreliable, and were soon abandoned. Since all attempts to dehydrate and imbed the

<sup>1</sup> Ztschr. f. Geb. u. Gyn., 1914, lxxvi, p. 321.

tissue in paraffin or celloidin caused more or less deterioration in the nerve staining, recourse was had almost entirely to the freezing microtome in the preparation of sections, thus making it impossible to prepare unbroken series, and greatly increasing the difficulty of tracing fibers in their course throughout the tissue. Nevertheless, many interesting preparations were obtained, from which Wallart was able to learn much concerning nerve distribution in the ovary; his findings in part confirmed and in part presented points of variance with the results of previous investigators in this comparatively little trodden field. One point of considerable interest brought out by these studies was the close correspondence between the relations in the human ovary and those of all the other animals used, practically no differences of any moment being discovered with regard to nerve distribution.

Starting at the hilus of the ovary, Wallart says, numerous large, tortuous bundles of nerve fibers can usually be seen entering at this region, the great tortuosity being, in his opinion, a provision for accommodation to the variations in the size of the organ which normally take place incident to ovulation. Most of these bundles gradually decrease in size by giving off branches as they pass through the ovarian stroma, but a few appear to run through to the cortex practically unchanged, there to break up into multitudinous subdivisions, which form such a rich plexus of partly medullated, partly unmedullated fibrils that this portion of the ovary must be considered to consist really in large part of nerve tissue. Wallart thinks that actual anastomoses between nerve fibers occur here, although this is a very difficult point to determine definitely. The nerve supply to the bloodvessel walls throughout all portions of the gland was also found to be extremely rich, probably as much or more so than in any other organ of the body.

The relations existing between nerve elements and the Graafian follicles are of interest. All follicles were found to be closely spun about with nerve fibers, not one of which, however, could ever be traced beyond the outer limits of the epithelial portion—in other words, there appears to be no penetration by nerve structures of the *membrana granulosa*, and of course, therefore, no direct nervous connection to the developing ovum. The relations with regard to the corpus luteum were found extremely difficult to study, owing to the large fat content of this structure, which took such an intense stain in the osmic acid preparations as to obscure everything, and which prevented all penetration of stain in the methylene blue preparations. So far as could be determined, the only nerves in the fresh, fully developed corpus luteum are those which accompany the bloodvessels in the connective tissue septa, none penetrating between the lutein cells themselves. After retrogression and degeneration of the corpus luteum has begun, however, many delicate fibrils, which can hardly be interpreted other than as nerve fibers, are often to be found running between the lutein cells, sometimes

in close relationship to capillaries, in other instances showing no such relationship. Just why this nerve supply to the individual cells should appear only after the corpus luteum has passed its highest point of development, and has begun to undergo retrogression, Wallart was unable to determine, although two possibilities are to be considered; either that owing to imperfect technique it is not possible to demonstrate the nerve fibers until the cells begin to degenerate, or that this late appearance of nervous elements has something to do with the subsequent development of the so-called "interstitial gland" of the ovary. During the later stages of retrogression of the corpus luteum the theca interna forms what the author fully believes we are justified in considering an interstitial gland, in the human as well as in other mammalian ovaries, and during this time an extremely rich network of nerve fibers is always to be found. Even when the ultimate stage of corpus fibrosum formation has been reached, by which time the corpus luteum has apparently been converted into merely an inert fibrous scar, the nerve supply to this structure remains strikingly rich, a fact which has impressed Wallart with the belief that all these degenerative stages of the corpus luteum represent formations with a distinct purpose to fulfil, probably in the sense of providing for both a neural and a humoral correlation between the genital glands and other body organs, by means of nerve connections and of endosecretory products.

With regard to the question of *nerve endings*, many fibers were found simply to end free in the ovarian stroma; this appears to be the most common condition, and occurs throughout all portions of the organ. Occasionally a little knob-like swelling could be seen on the end of a nerve, and in some places there was a suggestion of a fiber terminating in close relationship with a cell, but no definite interpretations for these appearances could be evolved. No absolutely definite ganglion cells were found, although in many places along the course of certain fibers cell-like bodies occur which, morphologically at least, very strongly suggest them. Wallart is strongly inclined to believe that these do, in fact, represent ganglionic elements, but does not consider this proven by any means, and wishes to leave this question open, together with many others, for future investigation.

**Nervous Phenomena Following Bilateral Oöphorectomy.** There is probably no subject in the entire field of gynecology which has aroused more active discussion than that as to whether the ovaries have any function other than the production of ova; in other words, whether they elaborate any secretion which has an influence upon the psychic life of the individual. While undoubtedly the vast majority of gynecologists today believe in the existence of such an action, and in recognition of its importance to the well-being of their patients attempt to conserve ovarian tissue wherever possible, it is unfortunately true that there are still some who steadfastly refuse to see any excuse for the existence



of an ovary after the power of procreation has for any reason been lost, attributing all the nervous phenomena which are so often complained of after an artificial menopause to the imagination of the patient or her physician. It is of interest, therefore, to get an opinion on this subject from the standpoint of the neurologist, who is often in a better position to judge of ultimate results than the busy surgeon, who may in many instances never see the patient again, once she has left the hospital. In a paper presented before the Neurological Section of the American Medical Association at its last meeting, Gordon<sup>1</sup> reports some observations extending over a period of several years upon 112 patients from whom both ovaries had been removed during sexual life. In 23 instances, the uterus had been removed as well.

In 37 of these patients, oöphorectomy had been performed through what must be considered gross errors of diagnosis, the ovaries having been removed in the hope of relieving vague neurotic pains in the abdomen, supposedly of genital origin. In a few of these women a temporary improvement occurred in preëxisting functional disorders, but soon the former conditions returned; in the majority there was no improvement whatever, and in all cases former nervous and psychic phenomena became aggravated following the operation, several of the patients having required temporary confinement to institutions. In 3 patients, who presented before operation no psychic disturbances, these began to appear shortly afterward, in the form of irritability, changeability, restlessness, and general inability of the individual to conform to her surroundings. Essentially normal ovaries had been removed from all these women, and this group of cases, while interesting and instructive, is therefore of less importance than the following, for there are certainly few competent gynecologists or surgeons today who would advocate such procedures as those to which these young women were subjected. They were really the subjects of gross maltreatment, rather than of rational surgery.

In the remaining 75 cases, however, the reproductive organs were found to be diseased on one or both sides, and radical operations were performed, both diseased and healthy portions of tissue being removed. Prior to the operations these patients complained of symptoms referable to the diseased viscera, such as pain in the abdomen and back, constipation, and general nervousness. The removal of the diseased organs relieved the local discomfort, but in the following months other and more distressing symptoms began to develop: formerly existing nervousness was accentuated, insomnia became a prominent feature, and then obsessions appeared. These were of varying nature, but concerned chiefly fear of death, of becoming insane, or of impending calamities. In some patients there was actual incapacity for mental work;

<sup>1</sup> Journal of American Medical Association, 1914, lxiii, p. 1345.

they lost all power of concentration, and all interest in subjects other than their ailments and complaints. Some even lost all power for enjoyment, and became altogether most pitiable objects. Another group developed extreme restlessness, which kept them constantly on the move from one place to another, and a small number eventually developed such a state of mentality that their removal to institutions became unavoidable. These women had no delusions, hallucinations, or other symptoms of dementia, but their extreme restlessness, insomnia, anxiety about the future, great tendency to quarrel, and episodic outbursts of anger, with impulses to attack, made it impossible for them to live with others, and rendered their isolation imperative. Since in the organs removed from these patients, healthy portions of tissue were invariably found, Gordon believes that the removal of the latter had some relation to the morbid phenomena observed, the logical conclusion being that when operations on the genital organs of women become necessary, the tendency should be to preserve as much as possible of any normal tissue that may be present.

While this may be considered a somewhat lurid picture of the disasters consequent upon double oöphorectomy, and undoubtedly is based on a collection of unusually bad cases, such as would naturally tend to gravitate to the neurologist, it at least emphasizes the fact that the ovaries are not to be removed with impunity, since their ablation is directly followed in certain instances by a most unfortunate train of disturbances, which may render the patient's last condition worse than the first.

**Vasomotor Irritability Following Oöphorectomy.** An attempt to attack this same problem, of the effect upon the organism of removing all ovarian tissue, from the experimental side, has been made by Hoskins and Wheelon,<sup>1</sup> who in the course of a series of studies upon the relations between various endosecretory organs have investigated the influence of ovarian extirpation upon vasomotor irritability, the vasomotor system being selected as exemplifying the sympathetic system as a whole. Its reactions to *nicotin* and *epinephrin* were tested by first obtaining from each of several animals a number of blood-pressure records under aseptic technique; the degree of sympathetic irritability to standard quantities of the drugs having been thus determined, the animals were castrated, and at intervals of approximately one and two months the irritability was again determined.

During the first month the reactions were irregular, and no conclusions could be drawn. At the end of one and one-half to two months, however, very pronounced augmentation in the reactions to *nicotin* occurred, amounting in one instance to over 400 per cent., and averaging over 200 per cent., or about seven times as much as the average variability

<sup>1</sup> American Journal of Physiology, 1914, xxv, p. 119.

of the normal series. Only one animal failed to show any perceptible reaction to castration; this was an old dog, in which it seems probable that the ovaries were not actively functioning.

The reactions to epinephrin were found to be very insignificant, indicating that the augmented irritability was neither in the sympathetic "receptive substance," nor in the vascular musculature, but was in the sympathetic system proper. Whether the augmented irritability would eventually disappear in dogs as it does in the human species the authors have had no opportunity to determine, but the results of these experiments are in conformity with the clinical evidence that the operation of castration in females causes for the time being, at least, a heightened irritability of the sympathetic nervous system.

**Biologic Relationship Between the Sexual Glands.** A short series of experiments tending to show the existence of certain biologic relations between the various glands connected with reproduction in the two sexes have been carried out by Götzl.<sup>1</sup> He injected numerous animals with various glandular extracts, and then after the lapse of a suitable period of time, injected them again with extracts of the same or other glands, in order to determine in what cases anaphylactic phenomena would occur, *i. e.*, what gland extracts would sensitize the animal against the subsequent injection of extracts of certain other glands. It was found that injections of testicle, prostate, mammary gland, or ovary are followed by anaphylaxis when a subsequent injection is made with any one of the other three, whereas animals injected primarily with thymus, thyroid, adrenal, liver, or kidney react only to a subsequent injection of the *same* gland. From this, Götzl concludes that the glands of reproduction possess a certain "organ-specificity" common to both sexes; in other words, the ovary, testicle, prostate, and mammary gland appear to contain a common albuminous substance which has the property of sensitizing an animal against any one of the other three, whereas other glands, not associated with the reproductive system, do not contain this substance, nor do they possess any common anaphylactic properties.

**Inhibitory Action of the Corpus Luteum Upon Ovulation.** The well-known theories of Loeb<sup>2</sup> with regard to the inhibitory effect upon ovulation produced by the corpus luteum have received marked confirmation from some experiments performed by Pearl and Surface<sup>3</sup> upon hens. Since the bird's ovary normally contains nothing either morphologically or physiologically homologous with the corpus luteum of the mammalian ovary, it seemed of interest to determine whether the injection of extract of mammalian corpus luteum would have any effect upon the process of ovulation in the bird. For this purpose,

<sup>1</sup> Zeitschr. f. Urol., 1914, 3 Beiheft, p. 401.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1912, p. 224.

<sup>3</sup> Jour. Biol. Chem., 1914, xix, p. 263.



20 adult healthy fowls, who were known to be actively laying, were injected under varying conditions with the commercial desiccated extract of cow ovaries put on the market by Armour & Co. This was given by intra-abdominal or intravenous injection, and in some instances was boiled before administration.

It was found that, when given in proper dosage, this extract of corpus luteum of the cow immediately inhibits ovulation in an actively laying fowl, the duration of the effect varying with different birds from a few days up to two or three weeks. After the bird begins ovulating again, laying goes on unimpaired. It was also found that all activity of the extract is destroyed by boiling, preparations so treated having no inhibitory action whatever on the process of ovulation. From these studies the authors consider it evident that mammalian corpora lutea must contain a *chemical* substance which inhibits ovulation in the bird, and that the function of ovulation is therefore to be added to the list of vital processes known to be under chemical control.

**Clinical Use of Corpus Luteum Extract.** The irregular results so often obtained from corpus luteum extract are believed by Dannereuther<sup>1</sup> to be due to the fact that the majority of pharmaceutical manufacturers take no note of whether the animals from which their extracts are prepared are pregnant or not, while as a matter of fact only extracts of *corpora lutea vera*, *i. e.*, those from pregnant animals, are of any efficiency. He says that since he has taken care to secure extracts only from pregnant animals he has had much better success than formerly, and cites a few cases in which the administration of the ordinary commercial extracts had been without effect, but which showed marked improvement when given extracts from pregnant animals. Dannereuther says that when using desiccated extracts of the latter sort he has rarely found it necessary to administer more than 5 grains three times a day; he carefully watches the blood-pressure of all patients under this treatment, and if it falls 15 mm. or more the drug is stopped until at least 10 mm. of the loss has been regained, when it is cautiously resumed. In no instance should the blood-pressure be allowed to drop below 90. Another point which Dannereuther considers of importance is the use of fresh extracts; he places the limit of reliability after manufacture at about three months.

**INDICATIONS.** The author says that in an experience covering about 80 cases of various sorts he has obtained the most satisfactory results from the use of corpus luteum extract in the following classes of patients:

1. Young women of the slightly obese, pale, anemic type, who complain soon after puberty of headache, nervousness, acne, constipation, and scanty menstruation. In addition to proper hygienic measures, and the administration of iron and arsenic, corpus luteum extract

<sup>1</sup> Journal of American Medical Association, 1914, lxii, p. 359.

apparently promotes the menstrual flow in these girls, and has a general beneficial effect.

2. Cases of dysmenorrhea due to functional ovarian disturbances. Patients of this type have almost invariably been relieved by corpus luteum.

3. Women in the climacterium (whether following a natural or operative menopause), suffering from hot flashes, psychoses, vesical irritation, etc. The results in these cases have been the most striking of all, and in two cases of pruritis vulvæ, associated with the menopause, the effect was almost magical.

4. Patients complaining during menstrual life of so-called "neurasthenia"—headaches, neuromuscular weakness, mental irritability, insomnia, and other indefinite subjective symptoms. These are often really reflex manifestations of menstrual disorders, and may be relieved by the administration of corpus luteum extract.

5. Finally, a remarkable case is reported, in which menstruation was reëstablished under vigorous corpus luteum treatment after a bilateral salpingo-oöphorectomy for ovarian abscess and pyosalpinx. The author says he is convinced that no ovarian tissue remained, and attributes the continuance of menstruation to the corpus luteum artificially injected. At the time of report the patient had been under observation for a year, and was still menstruating as regularly as before operation.

If we can accept this case as really representing the effect of corpus luteum therapy, we must consider it a truly remarkable result, and quite in contradiction to the experience of practically all others who have worked with this substance. The mere facts, however, that menstruation continued after double oöphorectomy, and that corpus luteum extract was administered, do not necessarily prove that the former was the direct result of the latter, for there have been too many cases reported of the same thing occurring after operations in which the surgeon was equally sure he had removed all ovarian tissue, but in which there was no subsequent organotherapy. These cases are probably to be explained on the ground of the existence of a supernumerary or aberrant bit of ovarian tissue, which has escaped observation at the time of operation, and it seems quite possible that in reality this condition may have been present in Dannereuther's case.

**Conservative Surgery of the Adnexa.** Aubert<sup>1</sup> says that when operation becomes necessary upon young women on account of pelvic inflammatory disease, if both ovaries are so involved that their removal cannot be avoided, he does a hysterectomy as well; wherever possible, however, he preserves some ovarian tissue, and in such cases thinks it very important to leave the uterus, so that menstruation may continue. In most instances, however, these uteri are large, heavy, chronically

<sup>1</sup> Rev. de Gyn. et de Chir. abdom., 1914, xxii, p. 465.

inflamed, and often painful. Merely to resect the tubes and one or a part of both ovaries, leaving the uterus untouched, does not therefore relieve the patient of her symptoms in all cases. Under these circumstances, Aubert has found the operation, originally proposed by Banttner, of resecting a wedge-shaped piece of the fundus most nearly to fulfil all the desiderata. He reports having performed it thirty times in the last six years, with very happy results. His technique, which differs somewhat from that originally described, is as follows:

After having opened the abdomen, inspected the pelvic organs, and determined that conservatism is possible, Aubert places on each side of the uterus a suture, as shown in Fig. 84, to control the ascending branch of the uterine artery, as otherwise the hemorrhage is apt to be

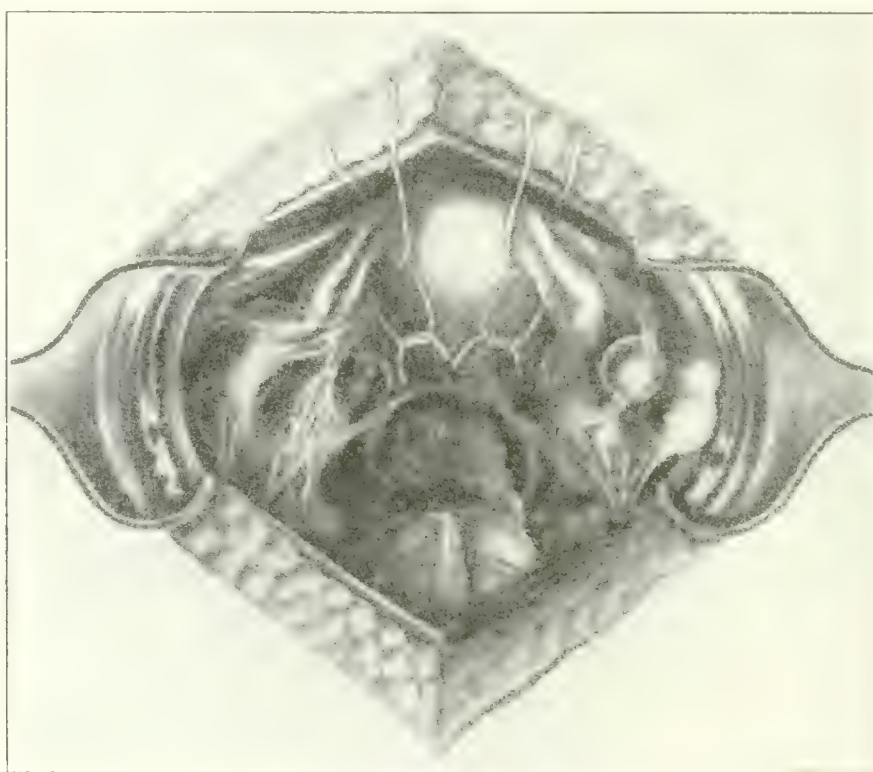


FIG. 84

rather profuse. Then by means of a sharp knife a wedge-shaped section is excised from the fundus, the lines of incision varying according to how much is to be removed, but avoiding if possible the attachments of the round ligaments, and of the ovarian ligament on the side upon which the ovary is to be preserved (Fig. 85). No hesitation should be felt in going well down into the uterine cavity, removing thus practically all the fundus. The wedge-shaped piece thus isolated is now bisected, and each half removed with the corresponding adnexa, or as much of them as is to be extirpated, the wound in the uterus and broad ligament being then closed in the usual manner (Fig. 86). The result is a uterus much decreased in size, with a certain amount of ovarian parenchyma, the latter varying according to the character of the case. The round



ligaments are intact: if it has been necessary to cut them, their ends should be reattached by suture to the cornua of the reconstructed uterus. The relations of the uterus to the bladder remain undisturbed. An additional, and it would seem in many instances, somewhat unnecessary step practiced by Aubert, is to suture the parietal peritoneum above the bladder to the fundus of the uterus, this having the advan-

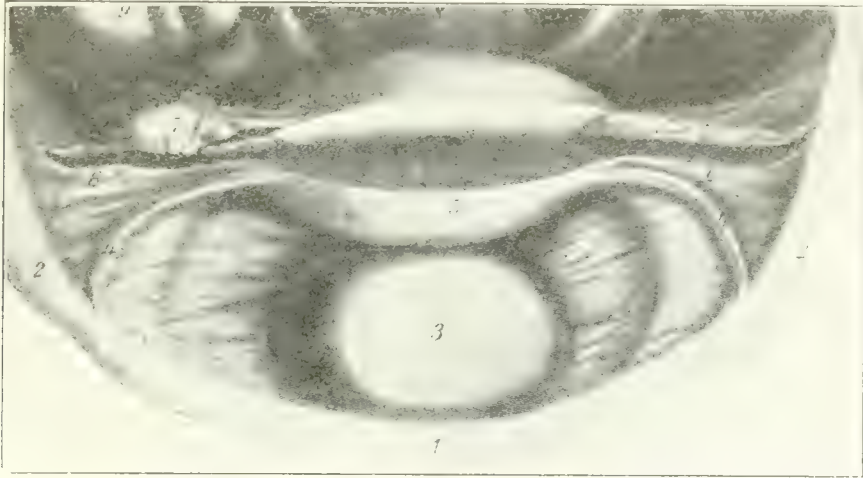


FIG. 85

tage, he claims, of protecting the line of suture in the uterus, and of keeping that organ in good ante flexion.

**Changes Occurring in the Ovaries After Removal of the Uterus.** While we hear a good deal about changes occurring in fibroid tumors, the uterus, and other structures after removal or destruction of the ovaries, comparatively little has been said about the opposite condition, the effect upon the ovarian tissue of ablation of the uterus, and it has often

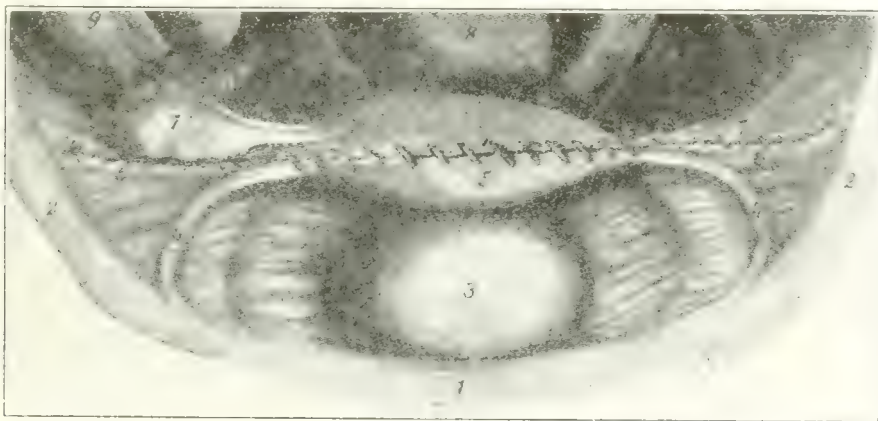


FIG. 86

been questioned whether the uterus has anything analogous to an endo-secretory function. That considerable changes in the ovarian structure may follow hysterectomy, however, is indicated by a report from Russia by Jakobson,<sup>1</sup> who states that microscopic examination of the

<sup>1</sup> J. akush. i jensk. bolez., 1914, xxix, p. 709; Internat. Abstr. Surg., January, 1915, p. 64.

ovaries of two dogs about three years after extirpation of the uterus showed contraction of the cortical layer, normal primordial follicles, developing Graafian follicles in all stages, and well developed corpora lutea. The number of primordial follicles as compared with the normal was apparently increased, and there were also many atresic forms. These conditions, together with a marked development of connective tissue in the cortical layer, seemed to the author to indicate the existence of trophic disturbances.

**Disappearance of Mammary Carcinoma after Oöphorectomy.** A rather remarkable case is reported by Torek,<sup>1</sup> suggesting the possibility of some not-understood effect upon the general economy of ovarian removal. The patient was a woman, aged fifty-seven years, upon whom he had performed five years previously a radical operation for carcinoma of the breast with glandular involvement. She returned after this lapse of time on account of a fibroid of the uterus, but on examination was found to have in addition about a dozen characteristic nodules at the site of the former breast excision. A panhysterectomy was performed, with removal of both ovaries. Nine months later the patient was reëxamined, but no trace of the nodules in the breast scar could be found. Torek says that he had previously observed 7 cases in which a mammary carcinoma (not a recurrent growth) became markedly smaller or even disappeared following double oöphorectomy, but with one exception the tumor always returned after a few months. In one instance the patient lived for more than a year without demonstrable recurrence, and then died suddenly with symptoms suggestive of an internal metastasis. As similar experiences have been reported by Beatson and others, Torek concludes that "the operation of castration in these cases should not be relegated to the heap of therapeutic rubbish, where most of us have placed it, but should be remembered in cases where we are unable to do anything better."

### THE VAGINA AND VULVA.

**Bacteriology of the Vagina.** The bacteriology of the female genital tract appears to furnish a field of study beset with much difficulty, and we possess today comparatively little exact knowledge as to the nature of the organisms which may occur there under normal and pathological conditions. Several papers have appeared during the year giving the results of investigations in this field, but in common with others that have preceded them, they for the most part give evidence of a vast amount of careful and laborious work—innumerable smears, cultures, platings, and transplantations—with very little definite, or

<sup>1</sup> Ann. Surgery, 1914, lx, p. 476.

at least practical information as a result. Thus, Curtis,<sup>1</sup> in a paper entitled "On the Etiology and Bacteriology of Leucorrhœa," gives a considerable list of organisms which he has isolated from vaginal discharges, but most of which he has been unable to identify. He has found uncontaminated vaginal secretions to contain a preponderance of the large, gram-positive "vaginal bacilli" of Döderlein, but in most instances a varying number of contaminating organisms are found as well, most of these being anaërobic in type, although cultures made from the vulvar region usually show a higher proportion of aërobes than do those from higher up in the vagina. Intraperitoneal injections into guinea-pigs of vaginal washings from several patients failed to show noteworthy evidences of toxicity. Streptococci were practically absent; staphylococci were often found, but were few in number, and apparently have little importance in the production of leucorrhœa; the same can be said of colon bacilli.

So far as these investigations led to any definite conclusions, it appears that the gonococcus plays the chief rôle in *initiating* leucorrhœal discharges, but then, after creating conditions favorable for the development of other organisms, so completely disappears that it is no longer demonstrable by any means at our command. This suggests that its chief activity in chronic leucorrhœa consists in preparing the soil for the leucorrhœa-producing organisms of the anaërobic group. Curtis is of the opinion that the *uterine cavity* remains practically free from bacteria in these cases, the purulent discharges being formed in the lower genital tract (lower cervix, vagina, and vulva).

In a subsequent paper, "On the Pathology and Treatment of Leucorrhœa," Curtis<sup>2</sup> comes to the conclusion that practically no type of treatment is of much permanent value. He advises against the use of douches, curettements, and tampons, and thinks the most benefit is to be obtained from thorough destruction of the cervical glands by means of repeated scarification, or repeated application of a 20 per cent. silver nitrate solution, since in them arises a mucous secretion which forms an excellent culture medium for bacteria. He has seen little benefit from autogenous vaccines, although he gave them a thorough trial.

A somewhat similar series of studies have been made by Sharp<sup>3</sup> upon the bacteriology of vaginitis in children, in order to determine, so far as possible, whether or not this condition is always gonorrheal in origin, and if so, how long gonococci continue to be the exciting cause. The patients on whom the examinations were conducted varied in age from fifteen months to thirteen years, and were taken from the vaginitis wards of Chicago hospitals, their vaginal discharges having been diagnosed as gonorrheal from the routine hospital smears. In

<sup>1</sup> Surgery, Gynecology, and Obstetrics, 1914, xviii, p. 299.

<sup>2</sup> Ibid., xix, p. 25.

<sup>3</sup> Journal Infectious Diseases, 1914, xv, p. 283.



some cases the origin of the trouble seemed clear, the discharge having come on following rape, while in others it was less certain. The complete *aërobic* bacteriology of 15 cases was studied by cultural methods, as well as by the careful examination of many smears. Aside from the gonococcus, the organisms most frequently found were the staphylococcus, colon bacillus, and bacillus pseudodiphtheriticus. Five children with normal vaginas were examined, and the same three organisms found, so that it appears questionable whether these can be considered in any way pathogenic; they certainly cannot be the sole exciting factor in leucorrheal cases, nor do they entirely replace the gonococcus.

Cultural demonstration of the gonococcus proved difficult, but was successful in 22 out of 27 cases of vaginal discharge, while similar examinations of normal secretions revealed no organism resembling it. In a number of cases, complement-fixation and skin tests were made, with, as a rule, positive results only where the condition was of less than three months' standing. Since both these reactions may disappear while the discharge is still profuse and contains gonococci, the author does not consider their negative outcome any criterion of the cure of the disease. Smears were found to be as uncertain as all other methods of examination, only 7 out of 41 specimens (Gram stain) being found clearly gonococcal, 14 probably so, and 20 too doubtful for diagnosis. Sharp thinks that unless large numbers of gonococci are present, smears are practically valueless. He concludes from his work that vaginitis in children is largely, and perhaps entirely gonococcal in origin, and that gonococci are present as long as the discharge continues. No one method can be considered sufficient for a diagnosis, but apparently the most reliable is the cultural demonstration of the organism. Next in order of reliability were found to be the cutaneous and the complement-fixation tests, and last of all smears. By a combination of these methods, repeated several times if necessary, Sharp thinks the presence of the gonococcus can generally be demonstrated, but so far no satisfactory method has been discovered for determining the time of its complete elimination, and of thus giving a definite criterion as to cure.

**Treatment of Vaginitis in Children.** Taussig<sup>1</sup> reports the results of careful study of 66 cases of vaginitis in children, treated during a period of eighteen months at the Gynecological Dispensary of Washington University, St. Louis, investigations of the home conditions of many of the patients having been carried out coincidentally by the social service department. Of these 66 children, all but 3 showed gonococci in the discharge at some time or other. Their ages ranged from three weeks to twelve years. Taussig believes that the most common source of infection is furnished by school lavatories, or by those used by several families in tenement districts. He was not able definitely

<sup>1</sup> American Journal of Medical Sciences, 1914, cxlviii, p. 480.

to trace any of the cases to rape, and thinks that in only a few instances was direct transmission from the mother, or transmission by clothing or towels responsible. Treatment of these patients is usually considered very unsatisfactory, but by adhering closely to the following technique, Taussig says that he has been able to secure excellent results:

No douches are given by means of a catheter, or other instrument introduced into the vagina, but an ordinary small, rubber-tipped urethral syringe is pressed tightly over the hymeneal orifice, and from 15 to 60 drops of fluid are injected several times in succession, thus ballooning out the vaginal folds, and bringing the solution in contact with every part of the mucosa. In the very early stages, Taussig begins with the less irritating silver salts (25 per cent. argyrol), but as soon as possible goes over to 1 per cent. silver nitrate, gradually increasing this to 2, or in some cases even to 4 per cent. In the acute stage he considers bed treatment essential, while good food and air, and an iron tonic, are of great value at all times. His average method of procedure in treating a case of vaginitis in a girl of school age might be summarized as follows:

During the first two weeks as much rest in bed as possible, with injections of 25 per cent. argyrol twice a day if the patient is in a hospital; during the third and fourth week, daily instillations of 1 per cent. silver nitrate; fifth to sixth week, instillation of 2 per cent. silver nitrate every other day; seventh to tenth week, instillation of 4 per cent. silver nitrate twice, and later once a week. Finally, if the child remains free of discharge for a month, send her to the country for one or two months without treatment. Taussig emphasizes that in order to be successful, this or any other form of treatment must be carried out systematically, and over a long period of time.

**Primary Vaginal Carcinoma Following Long Continued Use of a Pessary.** An unusual case of primary carcinoma of the vagina consequent upon the use of a pessary is reported by Edelberg.<sup>1</sup> The patient was sixty-eight years of age; fifteen years previously she had been given a pessary because of vaginal prolapse, and for a time had returned occasionally for its removal and cleansing. She eventually became tired of this, however, and disappeared from sight for twelve years, during which time she wore the ring uninterruptedly. She then appeared complaining of a bloody discharge, and on examination was found to have an inoperable squamous-cell carcinoma of the vagina, originating on the basis of a deep ulcer at the point of impaction of the posterior limb of the pessary. The etiologic relation seemed clear, the uterus being entirely free. Although such cases are comparatively infrequent, they emphasize the importance of keeping all patients who are wearing pessaries under supervision, and of treating any eroded or ulcerated areas produced before a malignant condition is reached.

<sup>1</sup> Zentbl. f. Gyn., 1914, xxxviii, p. 265.



**Carcinoma of the Vagina Treated with Radium.** A case reported by Legueu and Chéron<sup>1</sup> is of interest as demonstrating at least the possibility of completely eradicating an accessible urethrovaginal cancer by the use of radium, even though in this particular instance the cure was purchased by a destruction of tissue which eventually led indirectly to the patient's death. A woman, aged twenty-six years, had suffered for over a year with a growth originating about the external urinary meatus; micturition was almost incessant, and excruciatingly painful, so that the patient had become reduced to a deplorable condition. When first seen by Legueu, the entire upper portion of the vulva was involved in an indurated, but ulcerated and easily bleeding tumor mass, in the centre of which the urinary meatus was barely visible. The induration extended well down the labia minora, and back along the urethra to the cervix; the entire pubic portion of the vagina was as stiff as a piece of cardboard. In view of the extensive character of the process, all thought of radical operation was put aside, but a small piece of tissue was removed for examination, and found to be typical squamous-cell carcinoma, probably originating in the vagina, rather than in the urethra.

At the request of Prof. Legueu the case was taken over by Chéron for radium treatment, external applications being made at first with a flat applicator containing 50 mg. Six seances of five hours each producing no appreciable effect, the patient was anesthetized, and a small tube containing 50 mg. of radium sulphate was introduced into an incision in each lateral mass. This was followed by considerable shrinkage of the tumor, with marked diminution of the bloody discharge which had been present. A month later, a tube containing the same amount of radium was inserted into the urethra, and left in place for twenty-four hours, being reinserted after each micturition. This treatment was followed by gradual diminution of the pain on urination, while the perivaginal masses melted away, leaving soft, painless, cicatricial tissue. The patient's general health improved, and she gained several pounds, but a recurrence of the dysuria, with a slight sanguinolent discharge from the urethra, aroused suspicions of a recurrence in that organ, and a second urethral application of radium was given. Following this, a radium dermatitis developed, which lasted for six weeks, and was associated with incontinence.

Several months later the girl presented an appearance of perfect health, and was entirely free of all symptoms save the persistent incontinence, which was due to the complete destruction of the urethra that had occurred following the second exposure to radium. Examination at this time showed the vagina to be firmly fixed to the pubis in front, with an opening directly into the neck of the bladder; otherwise

<sup>1</sup> Rev. prat. d. Mal. d. Org. Genito-urinaires, 1914, xi, p. 86.



the vagina and vulva were absolutely normal. This condition was maintained for two and a half years, by which time the girl absolutely demanded that something be done for the incontinence, as she was contemplating marriage, although Leguen strongly counseled further delay before undertaking any operative procedures. He finally consented, however, and considering any attempt at plastic work futile, in view of the extensive loss of tissue, implanted both ureters into the intestinal tract. Leakage occurred around one of his sutures, however, and peritonitis developed, from which death occurred in about a week. A very thorough autopsy was performed, and numerous microscopic sections were made from the uterine, vesical, and vaginal tissues, as well as from all the related lymph nodes, but no trace of anything suggesting malignancy was found in them, or in any other part of the body. As the authors point out, it appears evident that a positively malignant tumor, proved by microscopic examination, was completely destroyed, this fact also being proved by microscopic examination

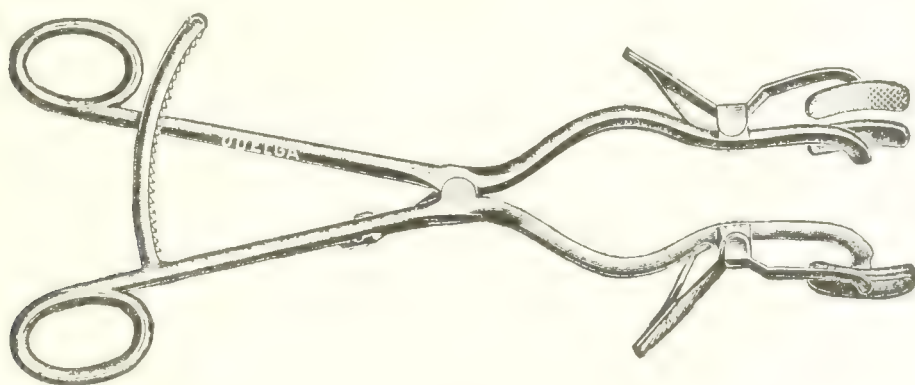


FIG. 87

after thorough autopsy. That the destruction in this instance went beyond the desired limits shows merely, in their estimation, that technique and dosage are matters which have not as yet been mastered, without detracting from the cardinal fact of the possibility of thorough eradication of malignant tissue by means of radium.

**Technique of Radiotherapy of the Vulva.** Freund<sup>1</sup> says that he, in common with many other Röntgenologists, has found the greatest benefit from x-ray therapy in the treatment of vulvar affections such as kraurosis, epithelioma, Paget's disease, ulcer rodens, eczema, and especially pruritis, many of the most stubborn cases of these conditions yielding to this form of therapy after all others, short of nerve resection, or extirpation of the vulva, have failed. In applying the rays, however, he considers of great importance one point which is often overlooked, namely, that if the vulva are not kept well separated throughout the exposure, only the outer edges of the labia majora will receive their

<sup>1</sup> Fortschr. a. d. Geb. d. Röntgenstrahlen, 1914, xxii, p. 295.

full force, the lateral surfaces of the labia majora, the labia minora, and the folds between them receiving little or no effect. To obviate this difficulty, Freund has devised the little instrument shown in Fig. 87. Each labium majus is grasped lightly by the clamp on one branch of the instrument, which is then opened as far as desired, and is left hanging during the exposure. It is light, and causes no inconvenience to the patient, but is much more satisfactory than the makeshifts which have been suggested, such as prying the labia apart with a wooden toothpick or matchstick wrapped in cotton.

**Gummatous Ulceration of the Vagina and Vulva.** An unusual case of syphilitic lesions of the lower genital tract has been reported by Bollag.<sup>1</sup> The patient in whom these occurred was forty-four years of age, a nullipara. She admitted having acquired a venereal disease at the age of twenty-one, at which time she had suffered from condylomata, these, however, soon disappearing under treatment. For some time before coming under observation she had had severe pruritis about the vulvar region. On examination, numerous old, keloid-like scars were found about the vulva, in the gluteal folds, and on the inner sides of the thighs. On both sides of the vulvar orifice were the remains of ulcers, with granulating bases and smooth borders; these were no longer suppurating, but showed beginning epidermization from the edges. In the middle of the vagina there was a marked annular stricture, above which was a large ulcer, and just below it another similar one, situated on the posterior wall. The tissue in the neighborhood of these lesions was remarkably soft and apparently edematous; there was no involvement of the rectum. The ulcer on the posterior wall of the vagina was excised for histological examination, but showed merely inflammatory tissue, without specific characteristics suggestive either of syphilis or tuberculosis. From the microscopic findings, neoplasm could be definitely excluded, however.

In spite of a negative Wassermann, and of the indefinite histology, a tentative diagnosis of syphilis was made, partly by exclusion, and partly from the history and clinical appearance. The correctness of this diagnosis was fully confirmed, in the author's estimation, by the therapeutic test, all the ulcers healing rapidly under a vigorous course of treatment with potassium iodide, followed by neosalvarsan and salicylate of mercury. Within a few weeks the condition had entirely cleared up, notwithstanding the fact that it had previously persisted for months. Bollag considers the lesions an expression of the tertiary stage of the disease and therefore gummatous in nature, an exceedingly rare condition in the vagina. The stricture which was present in that organ had probably resulted, he thinks, from the healing of a similar gummatous ulceration.

<sup>1</sup> Cor-bl. f. Schw. Aerzte, 1914, xlv, p. 1068.

**"Ulcus Acutum Vulvæ."** Under this designation, Lipschütz<sup>1</sup> described, a couple of years ago, a peculiar ulcerative affection of the vulva, which he was unable to bring into any of the groups of generally recognized conditions of this character, such as venereal, diphtheritic, tuberculous, or gangrenous ulcerations, balanitic erosions, etc. His report is based primarily on four cases observed in the skin clinic of one of the Vienna hospitals within a comparatively few years, with mention of a fifth case, probably of the same condition, seen some years previously. The former patients were all young girls, ranging in age from fourteen to seventeen years; the last named was a married woman, aged twenty-nine years. In three of the five cases the occurrence of sexual intercourse could apparently be entirely excluded, both from the patient's history and from examination of the genitalia, while in the two patients in whom intercourse had taken place at some time, this seemed to have no relation to the onset of the disease.

The condition, as observed by Lipschütz, appears to take one of two chief forms: It either comes on suddenly, almost over night, and is accompanied by chills, fever, and intense pain in the genital region, or the onset is much more gradual, and is not accompanied by marked subjective symptoms. In the first form, the disease runs a rapid course, and complete healing has usually taken place by the end of the second week, whereas in the latter type, the course is much more protracted, and recurrences may take place. The characteristic feature is the appearance of one or several ulcers about the external genitalia, usually on the inner sides of the labia minora. These ulcers involve only the superficial tissues; they have a smooth floor, often covered at first with a fairly adherent, grayish membrane, resembling that seen in diphtheria or croup. The edges are slightly elevated, sharply defined, and acutely inflamed. There appears never to be any involvement of the adjacent lymphatic vessels or glands, the process remaining always strictly localized. While these ulcers appear clinically very similar to ordinary chaneroids, their occurrence entirely independently of any possibility of venereal infection, together with the microscopic appearance of smears and sections of tissue, shows conclusively that their etiology must be distinct.

The diagnosis is easily made, the author says, by examination of a stained smear from the surface of the ulcers, this showing in all cases the presence of large numbers of very characteristic long, thick, rod-like bacilli, with square ends, lying either alone, or in short chains of not more than five. They stain deeply with all ordinary dyes, and are Gram-positive. They usually lie free between the pus cells, but occasionally one is found apparently within a leukocyte. Morphologically, their closest resemblance is to anthrax and hay bacilli. In no instance

<sup>1</sup> Arch. f. Dermatol. u. Syph., 1913, cxiv, p. 363.



were any organisms of the Ducrey type found, nor any fusiform bacilli or spirochetes. In sections of bits of tissue excised from the ulcers in some of the cases, the same organism was invariably found. Cultural experiments unfortunately did not succeed, and the author is not able, therefore, to place it definitely. Attempts to produce extra-genital ulcers by auto-inoculation were carried out in one patient, but were entirely negative.

With regard to treatment, Lipschütz says that while the condition tends to be self-limited, healing can apparently be hastened by the application of ordinary antiseptics, such as hydrogen peroxide and iodoform. No definite cause for the condition could be determined, and aside from the question of prognosis, which is of course most favorable, the chief point of interest in connection with it appears to be the forensic, since in spite of the great similarity existing between these ulcers and ordinary chancroids, the infection is certainly not venereal, whatever its origin may be.

Since the appearance of Lipschütz's paper, a few other men have reported similar observations. Thus, Gross<sup>1</sup> has had under his care a girl, aged twenty-two years, a *virgo intacta*, who had suffered four times within a year from attacks of ulcerations about the vulva. These ulcers showed exactly the same characteristics as those described by Lipschütz, were intensely painful, and examination of smears from the secretion showed the same large bacilli. Inoculation upon ordinary culture media resulted merely in a growth of streptococci. Rest in bed, with local applications of boric acid, led to complete cure in two weeks.

Volk<sup>2</sup> has also seen 4 cases of the same affection in women, 2 of these occurring in nulliparae, and 2 in multiparae. He says, however, that he has also observed a case in a man, aged forty-five years. There were numerous ulcerations on the skin of the perineum, and at the base of the penis. The Wassermann reaction was negative, as were repeated examinations of the secretion for Ducrey's bacilli and spirochetes, but the long rods described by Lipschütz were always present. The ulcers gradually healed under ordinary aseptic treatment. This author believes, therefore, that the condition may affect either sex, and that it is undoubtedly due to infection by a definite, but as yet unidentified organism.

### MENSTRUATION.

**Influence of Menstruation upon the Blood Picture.** A series of studies of the blood picture in relation to the menstrual epoch have been made by Gumprich,<sup>3</sup> using as subjects five healthy women between twenty and thirty years of age. The investigations were carefully car-

<sup>1</sup> Wiener klin. Woch., 1914, xxvii, p. 234.

<sup>2</sup> Ibid., p. 236.

<sup>3</sup> Hegar's Beitr. z. Geb. u. Gyn., 1914, xix, p. 433.

ried out, frequent samples of blood being taken both during and between the menses for a period of five or six months, but the author had the experience of most investigators who have attempted to demonstrate definite changes in some bodily function dependent upon the menstrual cycle—the attainment of entirely negative results. While the blood pictures varied markedly in the different individuals, there was no law or regularity discernible in these variations, either of the blood count as a whole, or of its individual elements; in some instances, indeed, some one type of cell, such as the eosinophiles, for example, seemed to show a definite rise or fall, as the case might be, at each oncoming period, but in another instance the variation would be in the opposite direction, or would show no regularity whatever. There is nothing in these investigations, therefore, to alter our belief that the phenomenon of menstruation is in nowise dependent upon any anatomical changes in the constitution of the blood itself.

**Influence of Menstruation upon the Blood Sugar.** That delicate changes, not perhaps in the anatomic constituents of the blood, but in the metabolic processes of the body, may occur at each menstrual period, is indicated, however, by some investigations of a somewhat different character, also carried out upon the blood, by Kahler.<sup>1</sup> In the course of some extensive studies upon the sugar content of the blood in various diseases, this author noted in some of his female subjects certain variations in the findings which he was at first unable to account for. It occurred to him that these variations might possibly have some connection with menstruation, and he therefore undertook an independent series of investigations upon a number of women, suffering from various conditions, to determine to what degree the menstrual process influences the blood sugar. In this work he employed the micromethod of Bang, which has been generally accepted as being sufficiently accurate for practical purposes, and has the advantage of requiring merely a few drops of blood, thus making it possible to take frequent observations upon the same patient. While Kahler's experiments did not go very far, they showed for the most part a distinct rise in the sugar content of the blood just before or during each menstrual period, with a return to normal at its conclusion. The author believes that this represents a true hyperglycemia at this time, but has not definitely proved that the reactions obtained are not due to the presence of reducing substances other than sugar, nor has he determined as yet to what this hyperglycemia, if such it be, is due.

**Vicarious Menstruation from the Breasts.** An interesting case of a very unusual type of vicarious menstruation, from the mammary glands, is reported by Hirschberg,<sup>2</sup> according to whom the phenomenon has only been described twice before. The patient was an apparently

<sup>1</sup> Wien. klin. Woch., 1914, xxvii, p. 417.

<sup>2</sup> Zentbl. f. Gyn., 1914, xxxviii, p. 929.

healthy young woman, in whom puberty had occurred at the age of eleven years, the periods always being regular and profuse. At fifteen years the breasts began to secrete a watery fluid at each menstrual period, and at seventeen years this secretion was replaced by blood. For the following ten years the patient had at each period, beginning a day or two ahead of the uterine bleeding, and continued for as much as six or seven days after its cessation, a discharge of blood from both breasts, more profuse from the right. At times the blood came spontaneously, at others only upon making pressure; it was accompanied by drawing pains. The patient had two miscarriages, one at the fifth and one at the fourth month; during these pregnancies both uterine and mammary menstruation ceased, but came on again promptly after the discharge of the ovum the first time; since the second pregnancy, in 1910, the mammary bleeding has never reappeared, no satisfactory reason for this being discoverable, but normal uterine menstruation returned, and has continued ever since. Hirschberg leaves the question open as to whether this curious phenomenon was due to some disturbance in the metabolism of the glands of internal secretion, or whether some form of bloodvessel neurosis was the underlying factor.

#### GYNECOLOGICAL PATHOLOGY.

**New Work on This Subject by Frankl.** For many years those who have interested themselves at all for the study of the pathology of the female genital tract have felt sorely the lack of any concise, and yet sufficiently comprehensive text-book of the subject for use as a guide. For some reason, this branch of pathology appears to have been singularly neglected; since the excellent work of Gebhard,<sup>1</sup> now over fifteen years old, so far as we are aware practically no book of greater scope than a small manual has appeared upon the subject, and yet it is one of sufficient importance and complexity to demand, and repay, careful attention from the scientific gynecologist. Of course, more or less thorough discussions of the pathological aspect of gynecology are to be found scattered through the larger clinical works, such as those of Kelly, and some of the German publications, but these are rarely to be found in the pathological laboratory, nor are they often available to the general pathologist; the latter is, moreover, as a rule, admittedly weak in the diagnosis and interpretation of gynecological specimens, but has found it difficult to inform himself, as many of the most important advances of recent years in this field remain buried in the journalistic literature.

It is therefore with the greatest pleasure that we record the appearance during the past year of a most excellent monograph upon gynecological

<sup>1</sup> Pathologische Anatomie der weiblichen Sexualorgane, Leipzig, 1899.



pathology, from the pen of Frankl,<sup>1</sup> the pathologist of the I Gynecological Clinic in Vienna. Comprising about 300 large 8vo pages, the work covers the subject with sufficient detail for all average purposes, without being too burdensomely voluminous; moreover, the author has gone through the literature with a fine-tooth comb, and gives at the end of each section a carefully selected list of references to the most important articles bearing upon it, from which one who wishes to look up any particular topic more in detail will get an excellent start into the literature.

The entire field is divided into nine main chapters, as follows: (1) Uterus. (2) Placenta. (3) Tube. (4) Ovary. (5) Parovarium. (6) Vagina. (7) Vulva. (8) Peritoneum. (9) Pelvic Connective Tissue and Ligaments. The text is embellished with over a hundred black and white drawings or photographs of gross specimens, and with a somewhat larger number of the most exquisite colored microscopic drawings that it has ever been our pleasure to see. Practically all important objects in the field of gynecological pathology are represented, and the reproductions are such that a study of the plates is almost as good as examination of the original sections, something which can very rarely be said of histologic drawings, as anyone well knows who has done much work along this line. To all who have interest for gynecological pathology, and can read German, we cannot do better, therefore, than to recommend a careful study of Frankl's monograph. Since, however, it has not as yet appeared in English, if, indeed, it will ever do so, we feel that it may be of interest to take up a few of the somewhat moot questions of gynecological pathology upon which the author, although giving due consideration to the views of others, fortunately does not, as a rule, hesitate to express opinions and conclusions of his own.

**The Endometrium.** Frankl accepts fully the Hitchmann and Adler<sup>2</sup> teachings with regard to the pathology of the endometrium, and agrees with them that the cases which formed the group of "endometritis glandularis" of the older authors represent either (1) normal menstrual changes, (2) physiologic variations in gland-richness, or (3) *non-inflammatory hyperplasia*. That inflammation has nothing to do with the production of the latter condition is shown by the rarity with which true inflammatory changes are found in the stroma in cases of this type. The chief gross characteristics of this hyperplastic endometrium are that it measures from 10 to 15 mm. in thickness, and presents an irregular, rumpled surface, beneath which small cysts can often be seen with the naked eye or magnifying glass; microscopically this condition

<sup>1</sup> Pathologische Anatomie und Histologie der weiblichen Genitalorgane, forming vol. ii of Liepmann's *Kurzgefasstes Handbuch der gesamten Frauenheilkunde*, Leipzig, 1914.

<sup>2</sup> *PROGRESSIVE MEDICINE*, June, 1914, p. 236.

is distinguished from menstrual mucosa by the lack of the more or less definite division into three zones which occurs in the latter. The gland-types are irregular; they are scattered about in a disorderly fashion, and show great variations in secretory activity, a considerable number nearly always presenting varying degrees of cystic dilatation. Determination of the phase in the menstrual cycle is naturally very difficult. This type of endometrium is probably due, Frankl thinks, to long-standing hyperemia, hence the name "*subinvolutio mucosæ*," which has been suggested, is more or less apt. Of course, in some cases an endometrium of this type can become inflamed, and then true inflammatory changes will be found as well; they have nothing to do, however, with the production of the hyperplasia.

A true *endometritis*, in Frankl's opinion, is always the result of definite *infection* of the endometrium by specific organisms, such as streptococci, gonococci, staphylococci, tubercle bacilli, or other less frequently occurring species; in many instances, however, it may be no longer possible by histologic methods to demonstrate organisms in the tissue. Acute endometritis is usually either of gonorrheal or septic origin, and is characterized by an intense round-cell and polymorphonuclear leukocytic infiltration, necrosis, false-membrane formation, thrombosis, etc. The inflammatory infiltration may extend into the underlying muscle tissue, but this process must be very definite before Frankl is willing to speak of a "metritis" or "myometritis." For the diagnosis of *chronic endometritis*, Frankl thinks that such criteria as connective tissue proliferation, increased vascularity, the occurrence of perivascular fibroblasts, etc., as suggested by Albrecht, are perhaps of theoretical interest, but too difficult of demonstration for practical purposes. Diffuse infiltration of the stroma by round cells, or considerable groups of these in the neighborhood of bloodvessels or lymph spaces, are of considerable significance, provided the specimen was not taken in the late premenstruum or during menstruation, at which times, as Frankl very justly remarks, such diffuse or scattered round-cell infiltration is entirely physiologic. The most reliable sign of chronic endometritis, however, is considered by Frankl, in common with Hitchmann and Adler, to be the presence of considerable numbers of *plasma cells*. An occasional cell of this type may be present, he thinks, in normal tissue, but when they are found in any quantity, chronic inflammation may be diagnosed with certainty. While it is true that in certain types of inflammation round-cell infiltration prevails, whereas in others, particularly gonorrheal, plasma cells are especially prominent, Frankl does not think that the distinction occurs with sufficient regularity to be available for the differential diagnosis of gonorrhea, as has been claimed by Schridde<sup>1</sup> and others.

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1913, p. 259.



**DYSMENORRHEA MEMBRANACEA**, or, according to the older designation, "endometritis exfoliativa," is a condition that in Frankl's opinion has nothing to do with inflammation, hence the inaccuracy of the latter term. The membrane which is cast off at each menstrual period is the superficial layer of the premenstrual endometrium; its cells generally show a high degree of degeneration, owing to the fact that the tissue has usually laid in the uterus for two or three days after separation before being expelled. The large amount of blood, and numerous small round cells often found throughout the stroma, are normal constituents of every menstrual mucosa, and are of no significance with regard to inflammation. The *cause* of this stripping off of the entire superficial portion of the endometrium in these cases, however, remains undetermined; various theories have been advanced, but none of them is conclusive, nor has Frankl one of his own to offer.

**Adenomyositis uteri** is the term applied by Frankl to cases of diffuse thickening of the uterine wall, with infiltration of the myometrium by gland-like formations resembling those found in adenomyomata, but without any circumscribed tumor. He thinks that this condition is usually of inflammatory origin, although in some cases no trace of inflammation can be found; to these latter he applies the term "adenomyosis uteri." The glands may originate, he thinks, from post-fetal proliferation of uterine mucosa, or from proliferation of embryonally misplaced parts of the Müllerian ducts, but he considers their mesonephric origin (*i. e.*, from remains of the Wolffian system) very improbable. In some cases, where the gland-formations are found in the outer layers of the uterine wall, their origin from the serosa comes into consideration. With regard to the glands in true *adenomyomas*, he thinks here also that a mesonephric origin, so strongly advocated by Recklinghausen some years ago, has been pretty well disproved, and while not actually denying the possibility of the occurrence of such tumors in the uterus, believes that only very rarely do the glands in adenomyomas arise from Wolffian remains.

**Malignant Degeneration of Fibroid Tumors.** This subject, which has attained much practical importance since the extensive introduction of x-ray treatment instead of operation, at least in Europe, is discussed at some length, the statistics of numerous authors being quoted. The percentage occurrence of malignant degeneration (sarcoma) in fibroid tumors observed by these men ranges from 1.2 (Olshausen) to the ridiculous figure of nearly 10 per cent. claimed by Warnekros,<sup>1</sup> from Bumm's clinic. The majority of the estimates fall around 2 or 3 per cent., and Frankl himself states that he has found sarcomatous changes in 2.3 per cent. of 514 personally studied myomas. As he very truly remarks, the much higher fixtures claimed by some authors are undoubt-

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1913, p. 237.



edly due to the fact that, on the one hand, retrogressive and degenerative processes of a benign character have been mistaken for malignancy, and on the other hand, that statistics have been based on entirely too small series of cases. While acknowledging that the diagnosis offers at times difficulties for even the most experienced pathologist, Frankl thinks we will not go far wrong if we hold to the doctrine, laid down by Borst and Meyer, that if an invasive and destructive tendency is exhibited by groups of cells, no matter how harmless they may appear individually, the process is malignant.

With regard to the *histogenesis of sarcoma* arising on the basis of a myoma, Frankl does not enter extensively into the voluminous discussions which have taken place, but says that we get over the difficulties most easily if we accept Meyer's idea that it is impossible for sarcoma cells to develop from fully differentiated cells of any sort (*aus voll ausgereiften Elementen*); in other words, a completely formed muscle cell or connective-tissue cell cannot "degenerate" into a sarcoma cell. According to this theory, "sarcoma cells arise from undifferentiated elements (*aus unreifen Elementen*), which on the one hand *could* develop into fully differentiated muscle or connective-tissue cells, or on the other hand remain undifferentiated, on a lower developmental plane, as round- or spindle-cells. The sarcoma cell is, therefore, a degenerative stage of a cell which in its earlier form was endowed with *potential* destructiveness."

**Endothelioma uteri** is considered by Frankl to be a tumor of very doubtful nature; at least he thinks it wisest to add a question-mark to all such diagnoses. He calls attention to the fact that the frequency with which cases are reported is steadily diminishing—a sign that with increasing histologic knowledge the tendency of pathologists is distinctly toward putting most of the so-called "endotheliomas" into the carcinoma class, since there are practically no certain criteria by which the endothelial origin of a new-growth can be proven in any organ which normally contains epithelium.

**Carcinoma uteri** is classified by Frankl in the manner proposed by Schottlaender and Kermauner,<sup>1</sup> and discussed at some length in these pages two years ago. As was brought out at that time, this classification gives up all attempt to consider the *histogenesis* of the malignant cells, since this is in most instances impossible of definite determination, but depends purely upon the *morphology* of the tumor as seen under the microscope. In this way, all uterine cancers are divided into (1) primarily solid, and (2) primarily glandular types, the former being subdivided into (*a*) ripe, those in which definite prickle-cells are found, (*b*) mid-ripe, in which no prickle-cells are present, but the cancer nests are made up of polygonal, well differentiated cells, and (*c*) unripe, in which

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1913, p. 200.

the cells are chiefly small, round or oval, very slightly differentiated elements. Frankl thinks that in the majority of cases, cancers originating in the cervix are of the primarily solid form, those originating in the corpus of the primarily glandular, though this rule is by no means constant. For the incidence of cervical growths he considers lacerations and erosions of the greatest importance, and says that personally he has never seen a tumor which could be demonstrated to have originated from the squamous epithelium of the portio in the absence of one of these conditions.

**Salpingitis** is considered by Frankl to be in every instance the result of infection by some microorganism, the gonococcus being by far the most common. Among others, however, which may at times be responsible are the streptococcus, staphylococcus, diplococcus pneumoniae, bacterium coli, bacillus typhosus, bacillus tuberculosis, spirocheta pallida, ray fungus, pneumobacillus of Friedländer, bacillus of malignant edema, proteus, and putrefactive organisms of intestinal origin. The relative frequency of these various types is practically impossible of determination, since only a few, such as the tubercle bacillus, produce characteristic tissue changes. Differentiation between gonococcal and streptococcal salpingitis, the two commonest forms, is impossible, however, in the majority of cases, in spite of Schridde's attempts to establish histologic criteria for this purpose. Infection may take place in various ways: in the case of the gonococcus, it is practically always by direct ascent through the uterus; in the case of the streptococcus, direct ascent, lymphatic propagation, and in pyemic processes, hematogenous transport come into consideration. In a few instances a descending infection probably takes place; *i. e.*, from a streptococcal peritonitis the organisms may pass directly into the tubal serosa, and also through the abdominal ostium into the lumen, thus infecting the mucosa. In many cases a perisalpingitis arises by extension from an appendiceal inflammation, and occasionally even an endosalpingitis may result, though this is certainly a distinct rarity, whose possibility has been denied by some authors. *Salpingitis nodosa* is, in Frankl's opinion, purely inflammatory, the result of healed abscesses of gonorrheal origin in the tube walls, and has nothing to do with the rare condition of small mesonephric adenomyomas at the tubal angles; the large majority of these so-called tubo-uterine adenomyomas (*Tubenwinkeladenomyome*) are also inflammatory, however, and have nothing in common with true tumor formation.

**Tubal Pregnancy.** In view of the many different theories which have been advanced to account for this condition, it is evident that no one etiologic factor can apply in all cases. By far the commonest cause is undoubtedly salpingitis, with in many instances resulting pockets and diverticula, in which the developing ovum can lodge; in other instances kinks or torsions of the tube, the presence of an accessory



tube, and very rarely tubal tumors, or external migration of the ovum, whereby it has acquired considerable erosive power before actually reaching the tube, may be the decisive factors. Nidation takes place exactly as in the uterus, *i. e.*, by active penetration and destruction of maternal tissues on the part of the ovum. The fetal tissues under these circumstances show absolutely no difference from those developed *in utero*; the maternal reaction, on the other hand, shows marked abnormalities, in that the barrier interposed between the fetal invasion and the uterine musculature by the thick layer of decidua is entirely wanting in the tube, the fetal elements thus arriving directly in the musculature as soon as they have penetrated the surface epithelium. The small groups of decidual cells occasionally seen in pregnant tubes are in no wise to be considered as having any functional value comparable to that of the uterine decidua, and possibly represent more than anything else merely a response on the part of the connective-tissue cells to an inflammatory stimulus associated with the pregnancy.

**Oöphoritis** is placed by Frankl in the same rubric as endometritis and salpingitis, that is to say, only processes which are the result of bacterial infection are classed under this term; other conditions which have been termed in many text-books "chronic, non-infectious oöphoritis," such as microcystic degeneration, follicular hypertrophy, sclerocystic ovaritis, etc., should really be placed under different headings altogether. While it is undoubtedly true that inflammation can, in some instances, lead to cyst formation in the ovary, definite evidences of the inflammation itself are always to be found as well; no such factor is demonstrable, however, in most cases of multiple small-cyst-formation (microcystic degeneration). As in the case of salpingitis, the commonest cause of oöphoritis is the gonococcus, next the streptococcus, and after these practically the same group of organisms mentioned in connection with tubal inflammations. One source of ovarian inflammation, which Frankl thinks is often overlooked, is that furnished by the acute infectious diseases; he says he has examined a number of ovaries from children who had had measles, scarlet fever, diphtheria, or typhoid, and found evidences of marked lesions of the follicular apparatus, with degeneration of the ova.

The mode of infection of the ovary by the gonococcus is undoubtedly in most instances by direct extension of the organisms from the abdominal ostium of the tube to the surface of the ovary; streptococcic infection may also occur in this way, or by lymphatic transport from the uterus or vagina, from a streptococcic peritonitis, or through the blood stream. The latter method explains the occasional occurrence of ovarian abscess after suppurative processes far removed from the genital system, such as an abscess of the tonsil, for example. The vast majority of streptococcal ovarian infections are, of course, of puerperal origin, however.



There is one point in ovarian pathology, of the utmost importance from the stand-point of the surgeon, which has unfortunately not been touched upon at all by Frankl, and that is the remarkable resisting power of ovarian tissue to the entrance of infection. While, of course, acute infections of the ovary do occur, and lead, as Frankl points out, to tissue destruction and abscess formation, the average operating gynecologist who never sees his specimens under the microscope would be astounded at the number of ovaries which he has dug out of dense adhesions, having been perhaps closely plastered against hopelessly destroyed pus tubes, but which show on microscopic examination practically uninvolved ovarian tissue. The surface epithelium of these ovaries is, of course, destroyed; a thick layer of inflammatory tissue may take its place, and unite the ovarian stroma to the intensely inflamed tube walls, but yet as soon as the true stroma of the ovary is reached, the inflammatory infiltration stops as though an invisible barrier had been placed in its way. It is undoubtedly true that untold numbers of ovaries are sacrificed every year by surgeons who, although excellent operators, are not pathologists, and do not realize the resisting powers of these organs. If there really is anything in the idea that the ovary furnishes some internal secretion, whose loss is by no means a matter of indifference to the woman—and the whole trend of modern opinion is most certainly toward such a belief—this one point alone would more than justify many a practical gynecologist in dipping a little more deeply than has been his wont into the pathological anatomy of his specialty.

**Ovarian Cysts** are divided into the RETENTION CYSTS and TRUE TUMORS. The former term, comprising follicular cysts, corpus luteum cysts, and of lesser importance, corpus albicans cysts and lymph cysts, Frankl accepts only so far as it implies the collection of fluid in preformed spaces, without any implied significance as to the etiology of this process. He does not consider it an altogether satisfactory term, but adopts it because of its universal employment. The condition of "microcystic degeneration," in which numerous small follicle cysts, varying in size up to that of a hazelnut, are formed in the ovary, he considers the result of *congestion*, and not of chronic oöphoritis, as is usually taught. He accepts Meyer's explanation for this, that as a result of hyperemia many follicles become enlarged, but that as soon as one reaches maturity, and is ready to rupture, the others are inhibited in their development, and undergo cystic atresia, the histologic characteristics of this process being disappearance of the ovum, degeneration of the theca, and gradual involution of the granulosa till nothing but minute remnants are left. In some of these ovaries the stroma is dense and fibrous, a condition easy to explain as a result of the hyperemia, and occasionally some inflammation may be present, but the formation of cysts is in no way to be considered due to prevention of the rupture of mature follicles by reason of a thickening of the albuginea.

The true cystic tumors are, of course, the CYSTADENOMA PSEUDOMUCINOSUM and the CYSTADENOMA SEROSUM. Of the histogenesis of the former Frankl says practically nothing is known definitely; he himself firmly disbelieves the theory that these cysts arise from proliferation of the follicular epithelium, and rather inclines to the idea that they are really of teratomatous nature. The cystoma serosum arises, he believes, from the surface epithelium of the ovary.

DERMOID CYSTS are very properly classed under the teratomata, of which they represent merely a cystic form, the distinction being in a general way that the dermoid contains fully differentiated tissues, whereas the teratoma proper (blastomatous teratoma, teratoblastoma) contains unriper, less differentiated elements, whence this tumor possesses a far greater proliferative potentiality, *i. e.*, *malignancy*, than the dermoid. While this distinction is fully justified from both the morphologic and biologic points of view, Frankl recognizes the existence of border-line cases, in which it is impossible to draw the line sharply. The *histogenesis* of the teratomata is, of course, a subject of many theories, and little definite knowledge. The author discards absolutely the older parthenogenesis idea, since this process has never been demonstrated in the higher vertebrates, and inclines to the Marchand-Bonnet theory of the very early displacement from their normal relations of certain somatic blastomeres, elements which have at that stage of development potentialities for differentiation into almost any type of tissue, the earlier the splitting-off occurs, the greater being this potentiality of the cells; the subsequent development of these aberrant elements then gives rise to teratomatous formations. Frankl admits that this theory does not explain satisfactorily the marked predilection of such tumors for the genital glands—ovary and testicle, but does not consider this shortcoming a serious obstacle to its acceptance as a whole, since our knowledge of the entire process of growth is so slight that much must remain as yet unexplained, and in other respects this theory appears the most satisfactory thus far offered.

**Tuberculosis of the Genital Organs** is considered by Frankl to be practically always secondary to some other focus, the result of lymphatic or hematogenous infection, generally the latter. This fact has been, he says, so universally accepted that about the only point remaining open for discussion is whether or not primary genital tuberculosis can ever occur. This is a matter which in his opinion can be determined only by most careful investigations on autopsy material, and even then presents almost insurmountable difficulties, for we know that about 96 per cent. of all bodies show somewhere signs of latent tuberculosis, and even if in any individual case no such be found outside the genital tract, the possibility still remains that the original focus was so small as to escape detection, or had completely healed. Without therefore abso-



lutely denying the theoretical possibility of a primary tuberculous infection of the uterus, tubes, or ovaries, Frankl implies that the occurrence of such has never been demonstrated to his satisfaction.

### THE FEMALE URINARY SYSTEM.

**Pyelography.** This is undoubtedly one of the most actively discussed problems in the field of urology today, and while it may be considered to have thoroughly established itself as a most valuable method of diagnosis in certain conditions affecting the kidney and ureter, its grave dangers when applied unskillfully, or in unsuitable cases, are gradually becoming recognized, and the last year particularly has seen the publication of numerous reports of more or less disastrous results. The consequences of an over-enthusiastic adoption of such a delicate procedure, especially in unskilled hands, may be so serious that we feel justified in quoting at some length from a few of these reports, and also in presenting in some detail an outline of the technique which has given extremely satisfactory results in a considerable series of cases to which it has been applied in the past two or three years in the gynecologic service of the University Hospital, Philadelphia.

In a paper presented before the Fourth Congress of the Deutsche Gesellschaft für Urologie, E. Wossidlo<sup>1</sup> reports a case from Zuckerkandl's clinic, in which at operation upon a woman several days after a pyelographic examination had been made, the renal pelvis was found filled with blood, while the kidney itself contained numerous infarcts, throughout which were masses of collargol in the intertubular connective tissue.

In consequence of the occurrence of this case, Wossidlo undertook a series of animal experiments somewhat along the lines of those carried out in this country by Eisendrath.<sup>2</sup> Wossidlo found that the moment the amount of collargol injected exceeds the capacity of the renal pelvis, it infiltrates into the interstitial connective tissue spaces between the tubules, even though no lesion or pathologic condition of the kidney substance be demonstrable. The larger the amount of collargol injected the farther does it penetrate toward the cortex, and when very large quantities were used, it passed through the walls of the pelvis into the surrounding connective tissue. In animals that were permitted to live for some days after injection, an active phagocytic process was established about the larger masses of collargol, but in no instance did the spread of the silver through the tissue appear to be dependent upon such action. In some of the experiments the pelvic wall was deliberately injured by thrusting a needle from the pelvis into the parenchyma; in these cases, not only did the subsequently injected collargol fill the tract

<sup>1</sup> Ztschr. f. Urol., 1914, 3 Beiheft, p. 357.

<sup>2</sup> PROGRESSIVE MEDICINE, December, 1914, p. 129.



thus formed, but it also spread very extensively throughout the entire kidney. In other cases, however, in which nephritis had been produced by the administration of uranium salts, there was practically no invasion of the renal substance by the collargol, although the technique was identical in all respects with that of the other experiments. It is evident, the author thinks, that in these kidneys there is an increased resistance, probably due to a higher internal pressure resulting from the nephritis.

The presentation of this paper aroused a most active discussion, the condensed report of which occupies ten pages of fine print, the speakers not limiting themselves to the dangers of pyelography, however, but considering also its indications, contraindications, technique, etc. It is evident that the entire question of pyelography is an extremely live subject with the German urologists, as it is with us, and that it has its strong advocates and equally vigorous opponents. The majority appeared to favor the continued use of the method, considering it in many instances an indispensable aid to diagnosis, but Blum, of Vienna, stated that he considers it dangerous and entirely unnecessary, everything that can be learned from it being accessible in other and simpler ways. While a number of the men stated that they have given up the syringe in favor of the gravity method of injection, others have not found one any safer than the other. The consensus of opinion appeared to be that the greatest safety lies in the use of a very small ureteral catheter (No. 5), so that any excess of collargol may flow back around it without pressure. Many of the men stated that they wait to make the exposure until this overflow collargol begins to appear in the bladder, either as demonstrated by the cystoscope, or by leaving an ordinary catheter in the bladder, the cystoscope having been removed.

Hofmann<sup>1</sup> reports a case of a girl, aged fifteen years, who presented symptoms of an infected hydronephrosis of the right side. Pyelography was performed by introducing a 4 per cent. collargol solution through a No. 4 ureteral catheter by gravity from an irrigator placed at a height of 30 cm. A very large amount of solution (120 c.c.) was used before it was seen to trickle out of the ureteral orifice beside the catheter; at this moment the flow was stopped, and the picture taken, the catheter being then left in place for about ten minutes to drain off the collargol solution. The patient felt no pain in the kidney region during the entire procedure, but about twenty minutes later she was seized with a violent pain in this locality, and four days later died with symptoms of peritonitis. At autopsy it was found that the collargol had ruptured the hydronephrotic sac; owing to perinephric adhesions, discharge of the fluid had occurred into the lesser peritoneal cavity, whence it had passed through the foramen of Winslow into the general peritoneum.

<sup>1</sup> *Folia urol.*, 1914, viii, p. 393.

Histologically, collargol was found in the uriniferous tubules and glomeruli, and had also escaped by rupture of the tubules into the surrounding tissue, with resulting areas of necrosis.

The same author reports a second case, a woman, aged thirty-two years, who was suffering from ureteral stone and pyonephrosis. A nephrectomy was performed three days after a pyelographic examination, and microscopic examination of the extirpated kidney showed collargol in the tubules and surrounding tissue, with areas of necrosis, but no rupture of tubules was demonstrable. In contrast to these cases Hofmann cites one, also occurring in a woman, of advanced pyonephrosis, for which nephrectomy was performed two days after a pyelography. On opening the kidney, it was found to consist merely of a large, thin-walled sac, filled with a thick brownish-black mixture of pus and collargol. The walls of the sac were simply connective tissue, all traces of renal parenchyma having disappeared, and no collargol was found in this tissue, from which observation Hofmann concludes that the silver salt enters the kidney tubules by direct pressure, and not by resorption, escaping by rupture or diffusion into the surrounding tissue, and there causing necrosis. His advice is to limit the use of pyelography to the few cases in which a diagnosis can be made in no other way.

Krotoszyner<sup>1</sup> reports a case of extensive renal infiltration by cargentos occurring in a man, aged thirty-six years. A pyelography was performed on the right kidney, 15 c.c. of a 25 per cent. cargentos solution being injected through a No. 5 bismuth catheter by means of a large glass syringe. The piston of the syringe was used under gentle pressure merely to start the flow, after which the fluid was allowed to enter the renal pelvis merely by elevating the syringe as much as possible above the level of the patient's body. In this manner the injection was continued while making the picture, black-colored fluid being seen to escape from the evacuating shaft of the cystoscope, which remained in place. There was at no time any pain or fever. The plate showed a moderate hydronephrosis, probably due to ureteral stricture. At operation three days later the exposed kidney showed on its surface a number of dark-colored areas projecting slightly above the surrounding tissue; there was a softened area at the upper pole, and on being opened the kidney showed several necrotic foci on the cut surface. A nephrectomy was performed, and the patient made an uneventful recovery. On microscopic examination, quantities of silver were found in the tubules, though in some places these had ruptured, and the silver had been extruded into the interstitial tissue. About these masses of pigment were considerable foci of necrosis, with extensive hemorrhages; in many of these areas were collections of polymorphonuclear leukocytes, forming aseptic abscess cavities, but no bacteria could be found.

<sup>1</sup> Surgery, Gynecology and Obstetrics, 1914, xix, p. 523.



The same author also mentions another case of renal injury following pyelography which he has observed. The subject was a cachectic man, aged seventy-three years, who died and came to autopsy a week after a pyelographic examination, severe parenchymatous lesions of the injected kidney being found.

Having had some trouble following the use of collargol for renal injections, Buerger<sup>1</sup> says that he tried argyrol for this purpose, but the occurrence of the following two cases in his practice has convinced him that neither of these substances is entirely safe under certain circumstances. The first case was that of a young girl, aged seventeen years, who had been operated upon for ureteral calculus, following which a ureteral fistula persisted for some time, with resulting partial occlusion of the lumen at the site of the ureterostomy, even a small catheter meeting with an impassable obstruction at that point. For diagnostic purposes, a collargol injection of 12 c.c. was given by means of a syringe, a nephrectomy being subsequently performed on account of massive adhesions involving the upper portion of the ureter. Gross examination of the kidney showed numerous small black areas on the surface, the blackish infiltration being found on section to extend about to the base of the papillæ, the tips of these, however, and the corresponding calyces being entirely free. Microscopically, collargol pigment was found in the tubules, in some of the cells, in glomeruli, and in foci of necrosis and inflammation.

The second case was a man, aged thirty-six years, with a demonstrable mass in the right kidney region. Pyelography was performed by injecting very slowly, with a syringe, 20 c.c. of a 40 per cent. argyrol solution, the radiogram showing a typical hydronephrosis. Within a few hours the patient complained of pain in the right lumbar region, and developed a temperature of 102°, but three or four days later both pain and fever had disappeared, and a second x-ray showed no visible argyrol remaining. Eight days after the performance of the pyelography the kidney was exposed, and was found considerably enlarged, with evidences of old perinephric inflammation. The parenchyma was intensely congested, and presented on its surface, after removal of the capsule, small areas of greenish-black discoloration. The kidney was not removed, but was merely drained, and the patient left the hospital free from renal symptoms. Two small bits of tissue excised for examination showed areas of extensive necrosis, which presented the picture of anemic infarcts with diffuse infiltration by argyrol. Although this was not present in all parts of the necrotic areas, it was found in sufficiently large quantities to arouse a suspicion that the infarction or necrosis was directly due to the drug.

From these two cases, Buerger says, it is evident that both collargol

<sup>1</sup> Surgery, Gynecology and Obstetrics, 1914, xix, p. 536.



and argyrol may invade the kidney substance right out to the cortex, being associated with necrotic lesions throughout the tissue. Although this invasion of the renal parenchyma was apparently not dangerous to life in either of his patients, the occurrence of such lesions cannot be regarded lightly. The author, in absolute disagreement with most urologists, does not believe that the trouble can be laid at the door of the technique (syringe instead of gravity method), but he does think that *interference with the outflow* of the injected fluid is an important factor; this was furnished in the first case by the ureteral stricture, and in the second by a prostatic abscess. Added to this, contractions of the renal pelvis, manifested by renal colic following pyelography, may be of importance. He therefore suggests that our efforts to prevent this complication should be directed toward securing thorough evacuation of the renal pelvis through the ureteral catheter, aided by irrigation with saline solution or boric acid whenever spontaneous drainage does not occur.

The importance of securing free drainage after filling the kidney pelvis with any silver solution is also brought out by a short, but rather interesting series of animal experiments performed by Keyes and Mohan<sup>1</sup> to determine if possible the mechanism of kidney infiltration by collargol under varying conditions. For this purpose, the following procedures were carried out: (1) Just sufficient collargol was injected into the renal pelvis of a dog to fill but not to overdistend it; the needle was then removed, and the kidney immediately extirpated. Microscopic examination showed a coating of collargol in the pelvis, with traces also near the periphery of the cortex, apparently in lymph spaces. There was no trace of silver in the tubules or glomeruli. (2) A similar injection was made, but the pelvis kept filled for fifteen minutes, and the kidney then removed. The collargol was found in considerable quantities in the bloodvessels adjacent to the pelvis, and to a lesser degree in the vessels and lymph spaces with the parenchyma. There were also slight but distinct traces in the glomeruli. (3) The pelvis was distended only momentarily, as in 1, but the kidney was not removed until twenty-four hours later. It was then found markedly congested, with hemorrhage in the connective tissue about the pelvis, but with no trace of collargol in the pelvis, vessels, or glomeruli, and only a few very slight traces in the tubules. (4) Distention of the pelvis was maintained for fifteen minutes, as in 2, and the kidney removed after twenty-four hours. This organ showed congestion, as in 3, but somewhat less intense, with collargol distribution similar to that found in 2, but more marked.

From these results, the authors conclude that momentary gentle dilatation of the normal renal pelvis causes little more than a congestion

<sup>1</sup> American Journal of the Medical Sciences, 1915, cxlix, p. 30.

of brief duration, whereas if the distention persists for a few minutes, the injected fluid is absorbed into the *bloodvessels* and *lymph spaces* about the renal pelvis. They consider the appearance of collargol within the glomeruli and tubules a purely *secretory* phenomenon, due to an effort of the kidney to get rid of the foreign substance.

A more common clinical condition, however, the authors believe to be a *secondary* infiltration of the renal tissue, the solution left in the pelvis and upper ureter being driven into the kidney substance by increased pressure resulting from the gradual secretion of urine into the pelvis if there is a constriction of the ureter sufficient to prevent free drainage. In order to simulate as closely as possible this condition of secondary infiltration, the following experiments were performed: (5) The whole length of a dog's ureter was exposed by abdominal incision, and a very small amount of collargol injected into it by means of a syringe inserted at its lower end, just above the bladder. As soon as the black column of fluid was seen to reach the kidney pelvis, and before any dilatation of the latter could possibly have occurred, the injection was stopped, and the ureter tied above the point where the needle had been inserted. The kidney, removed twenty-four hours later, showed the same changes as in 4; it seems, therefore, that secondary as well as primary collargol infiltration is due to vascular and lymphatic absorption, and that the collargol seen in the glomeruli and tubules is merely being excreted. This supposition was apparently very conclusively confirmed by two other experiments, in which the silver salt was found in the glomeruli of *both* kidneys, although only one was injected: (6) This experiment was practically a repetition of 5, the left ureter being injected, but this time both kidneys were removed at the end of twenty-four hours. On examination, collargol was found in the glomeruli and vessels of the right kidney as well as of the left. The *total* amount was much less, but the amount *in the glomeruli* was greater in the right than in the left, where it was largely in the tubules and interstitial tissue. (7) In order to determine what happens in the case of hydronephrosis, a dog's ureter was tied just above the bladder. A week later the kidney was exposed, and found to be hydronephrotic. The dilated ureter was punctured, 10 c.c. of urine withdrawn, and 3 c.c. of collargol solution injected, leaving the kidney less distended than before. The ureter was again ligated, and the wound closed. At the end of forty-eight hours the animal was killed, and both kidneys were removed. The hydronephrotic kidney, into whose ureter the injection had been made, showed extensive suppuration and widespread infiltration with collargol; the opposite organ showed also collargol in the cortical bloodvessels and in the glomeruli, but none in the tubules, nor anywhere in the medulla.

Keyes and Mohan believe that this secondary retention is of far greater importance than the primary retention at the time of injection, and think that it is probably the cause of most of the deaths that have



been reported from pyelography. They advise, therefore, that any alarming symptoms arising after this procedure should be treated by securing immediate drainage of the kidney, or by nephrectomy.

In the course of a considerable amount of this work carried out in the gynecological service of the University of Pennsylvania, two cases have occurred in which subsequent nephrectomy demonstrated an extensive infiltration of collargol into the kidney substance. These cases, reported by Keene and Pancoast,<sup>1</sup> both dated from our earlier experiences with pyelography, and may be considered the result of faulty technique. One was a case of early tuberculosis, the other of pyelonephritis and hydronephrosis; in both specimens collargol was found in the tubules, in Bowman's capsule (Fig. 88), and in certain areas in the interstitial tissue,

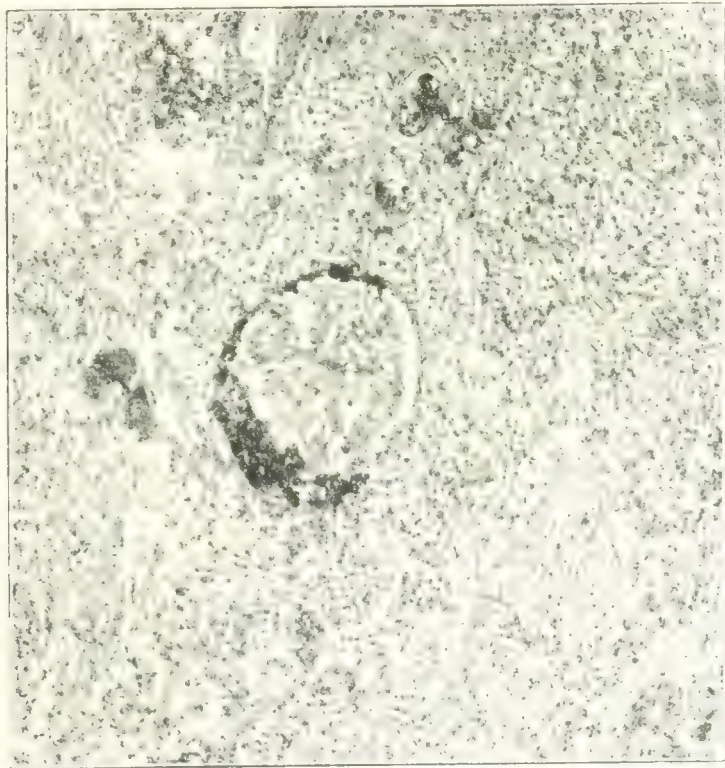


FIG. 88.—From photomicrograph. Argyrol in Bowman's capsule, also permeating the kidney tissue with a moderate degree of necrosis and round-cell infiltration.

the kidney substance always showing in these a high degree of degeneration. Severe pain had followed both these injections, which were evidently given under too high pressure. In our more recent work, no cases have occurred which gave grounds for the belief that any injury had been done to the kidney; the technique is, of course, a matter of prime importance, for this is work of a delicate nature, and must be properly performed if satisfactory results are to be obtained. The following method, as detailed by Keene, has gradually been evolved in our work, and appears to answer all requirements:

<sup>1</sup> Jour. Amer. Med. Assoc., 1914, lxiii, p. 523.



"The ureteral catheter should not exceed No. 6 in size; it must be free from rough surfaces, and pliable, so as to follow easily any change in the course of the ureter. In order to avoid trauma we never use a stilled catheter. The catheter is inserted a distance of 20 cm., and its further progress is made extremely slowly until the slightest buckling occurs, which indicates that its tip has reached the pelvis. It is then withdrawn 1 or 2 cm., and the character of urinary flow is observed to determine, if possible, the presence or absence of pelvic dilatation. The catheter is then withdrawn 10 cm. and the injection



FIG. 89.—Colon bacillus pyelitis with marked dilatation of pelvis due to ureteral kink. Symptoms relieved by pelvic lavage. The usual methods of treatment together with autogenous vaccines had been unsuccessful.

made. By doing so the danger of wounding the pelvis is minimized and the tip of the catheter is below the level at which the majority of ureteral kinks are found.

"If the urine is blood-stained the injection is not made, a subsequent examination being made at an interval of at least seven days. When an obstruction is encountered along the ureter, we do not attempt forcibly to overcome it, but pass a smaller catheter; if its passage is likewise impeded, the collargol is injected, and in the majority of instances will find its way upward. The forcible passage of the ureteral catheter is to be condemned under any circumstance, but this is especially true

when injection is to follow. We are opposed to the routine injection of both kidneys; when bilateral disease is suspected, the injections are made at two sittings. If, for any reason, the röntgenogram is unsatisfactory, we make it a rule to allow several days to elapse before attempting a second injection.

"The collargol is freshly prepared for each case; the crystals are thrown into a small mortar containing boiling water, and when cooled are thoroughly dissolved by stirring with a pestle. The solution is

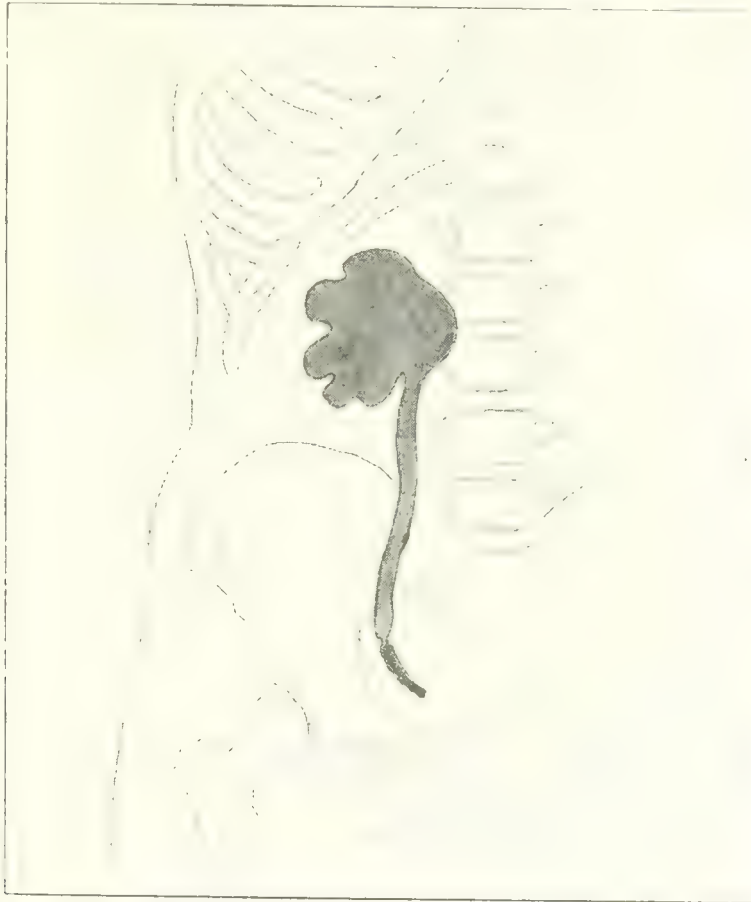


FIG. 90.—Stricture of ureter. Marked dilatation of ureter above stricture, and pyelonephritis of gonococcal origin. Pyelography was employed in order to eliminate calculus as a possible cause of ureteral obstruction. Lavage and collargol instillation resulted in temporary improvement.

filtered through cotton and gauze, and is ready for injection. The strength of the solution varies from 5 to 10 per cent., depending on the thickness of the abdominal walls. In making the injection we use a 30 c.c. burette, connected with a short tube and stopcock. To start the flow through the catheter, elevation of the burette to about three feet will be necessary, but it is immediately lowered, and allowed to flow at an elevation of not more than one foot with a No. 6, and two feet with a No. 5 catheter. The injection is discontinued when the column of collargol ceases to fall, or the patient experiences the first

slight sensation of fulness in the kidney region. After the picture is taken the collargol is drained off, and the catheter removed.

"We make it an invariable rule to keep our patients under observation in the hospital for twenty-four hours after injection, and prescribe copious draughts of water during the first six hours. When retention from angulation due to ptosis is suspected, the patient is required to remain in bed for twelve hours after the injection. This facilitates free drainage of any collargol that may remain in the pelvis of the kidney."

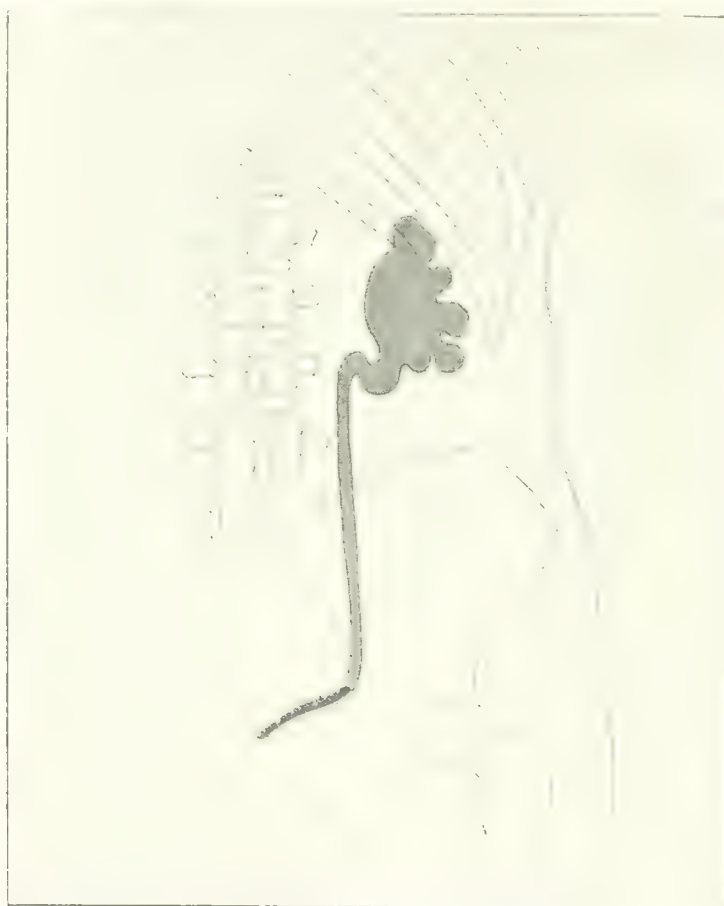


FIG. 91.—Ptosis of the left kidney with hydronephrosis. The catheter met an obstruction 4 cm. from the ureteral orifice. Pyelography demonstrated that the obstruction was not pathologic, but due to an abrupt change in the course of the normal ureter.

While the adoption of proper technique, carefully carried out, will reduce the harmful results almost to the vanishing point, it is undoubtedly true that even with the greatest skill and care there are possibilities of danger which should serve as a warning against the indiscriminate use of collargol irrespective of the underlying pathology. It should, therefore, be limited to cases in which an accurate diagnosis cannot be made by other means, and should never be used merely for depicting interesting anomalies. In the presence of ulceration, infection, or retention of the solution in the renal pelvis, the dangers are increased;



injection should, therefore, rarely be made in suspected cases of neoplasm, tuberculosis, or large hydronephrosis. In other infections than tuberculosis it is usually avoided if possible, but in cases of pyelitis it may be of the utmost importance to determine whether the condition is a mechanical dilatation of the pelvis with superimposed infection, or a true primary infectious pyelitis, so that if other methods fail to give the desired information, the risk of pyelography may be far outweighed by the value of the data it affords (Figs. 89 and 90)

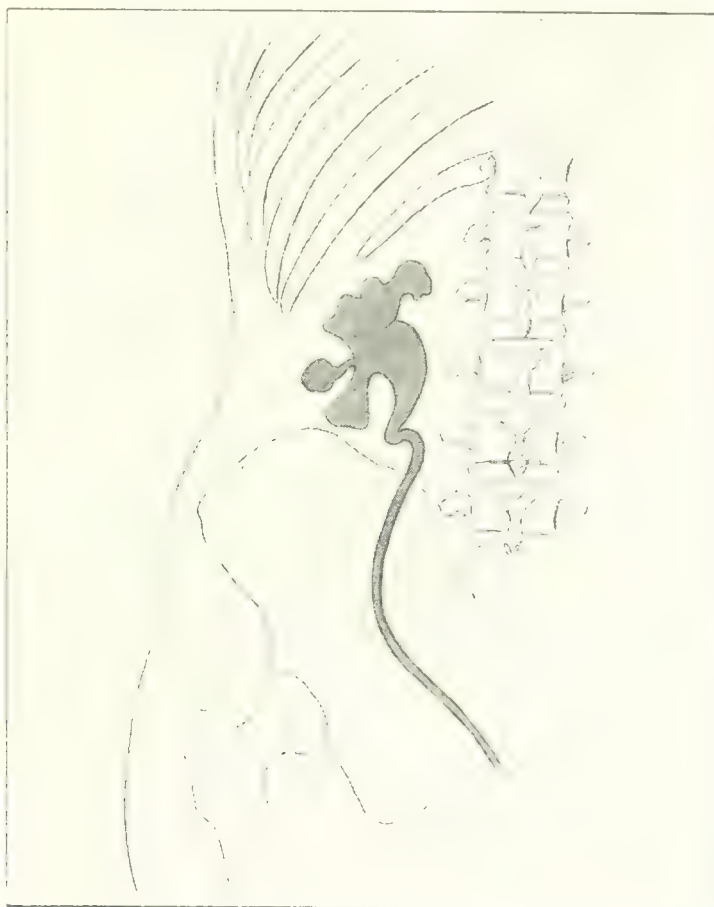


FIG. 92.—Beginning dilatation of the pelvis in a case of nephroptosis.

Pyelography serves its greatest usefulness in detecting the earlier stages of hydronephrosis due to mechanical blockage of the ureter other than by stone; in fact, it is the only means by which this diagnosis can be made with certainty (Figs. 91 and 92). In some cases of renal or ureteral calculi, when the information furnished by the ordinary röntgenogram is not definite, help may be obtained from a collargol injection (Figs. 93 and 94), this showing whether the supposed calculus-shadow lies within the kidney or ureter, or in adjacent structures, since a kink or some extra-ureteral cause may obstruct the passage of a catheter at a point about corresponding to the shadow seen in the x-ray.

**Treatment of Pyelitis.** In a paper based on the experience of the Urologic Department of Johns Hopkins, Geraghty<sup>1</sup> makes a plea for a more general appreciation of the beneficial effects of lavage of the renal pelvis in certain types of pyelitis. He does not agree with the opinion that a chronic pyelitis cannot exist without involvement of the parenchyma as well, since both clinical experience and pathologic findings show that a pure pyelitis may occur. While it is very probably true that in most instances pyelitis is secondary to a previous infection of the kidney parenchyma, in many cases the latter entirely disappears,

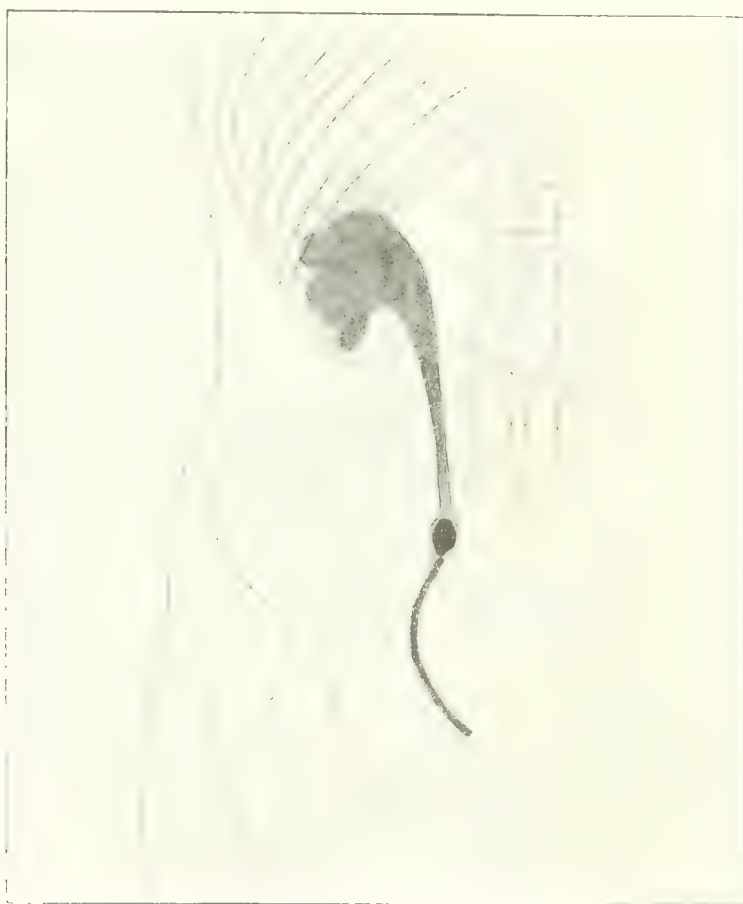


FIG. 93.—The röntgenogram failed to demonstrate a calculus. The catheter met an obstruction 13 cm. from the ureteral orifice. By means of a collargol injection, the calculus was clearly defined, together with a hydro-ureter and hydro-nephrosis.

leaving only the pelvis and ureter involved. The question of diagnosis is, of course, extremely important, and differentiation of a simple pyelitis from a pyelonephritis may be exceedingly difficult, unless recourse is had to functional tests, in which the author places much confidence. The presence or absence of albumin in the catheterized specimen has only been of help to him in occasional cases, but pyelography has proved useful in showing changes in the renal pelvis resulting from

<sup>1</sup>Journal of American Medical Association, 1914, lxiii, p. 2211.

infection. It has been Geraghty's experience that the particular type of organism causing the infection has very little influence on the prognosis. He divides pyelitis cases into the following three groups:

1. Those in which the catheterized specimen shows the presence of fairly active infection, with normal renal function, and with few changes in the pelvic outline, as shown by pyelography. The prognosis here is most favorable. Treatment is begun by injections of 5 to 10 c.c. of 0.5 per cent. silver nitrate, given through a catheter introduced only a short way into the ureter, so as to inject the latter as well as the



FIG. 94.—History in this case indicated ureteral calculus. A small cystic mass lay to the side of the uterus and the röntgenogram showed a shadow along the course of the ureter. Pyelography demonstrated a normal pelvis and ureter and an extra-ureteral shadow, which operation proved to be a tooth in a dermoid cyst.

renal pelvis, since there is usually some ureteritis associated with the pyelitis. The strength of the solution is gradually increased to as high as 5 per cent. in some instances, the tolerance of the individual and the reaction produced being the guides as to how rapidly, and to what degree this increase shall be carried. While of course the reaction should not be too severe, Geraghty has found that the production of some reaction is necessary if results are to be produced.

2. Cases of long-standing infection of the renal pelvis, with marked changes in the pelvic walls, but in which the catheterized specimen



shows only a very few leukocytes and an occasional organism. Here the infection is usually deep-seated, and difficult to eradicate; hence the prognosis is much less favorable than in group 1.

3. Infections of the renal pelvis associated with dilatation and residual urine. In this class of cases the prognosis is worst of all, and lavage has proved of little value. It should be tried, however, where nephrectomy is contraindicated, as marked temporary improvement is often seen, even though complete eradication of the infection may be impossible. In this type of case, Geraghty says he has found silver nitrate less efficient than solutions of formaldehyde in the strength of from 1 : 5000 to 1 : 2000. In treating these cases, the catheter should be passed all the way to the pelvis of the kidney, so as to drain off all residual urine.

Hirst<sup>1</sup> reports excellent results in the treatment of pyelitis by means of lavage through a *two-way catheter*, which is introduced through an ordinary water-distention cystoscope, and passed up to the pelvis of the kidney. Boric acid solution, followed by some silver preparation, is then injected by means of a syringe; there is no danger of producing over-distention, as a return flow is provided for by the two-way catheter. Hirst reports having treated 6 cases in this manner, all occurring in women. Several of the patients were brought to the hospital extremely ill, with high fever, great pain over the kidneys, and purulent urine, but in all the conditions cleared up very quickly. One point of importance, however, the author has had impressed upon him, and that is not to discharge these patients too soon. The improvement was so rapid in his cases that most of them were allowed to go after three or four days, presumably cured, but it was subsequently learned that at least three had had recurrences after leaving the hospital, not so severe as the first attack, and yielding to medical treatment, but nevertheless sufficient to warn that in future all cases of this type should be kept under observation for a longer time, and the irrigations continued for several days after the cessation of all symptoms. Nothing is said as to the importance of bacteriologic examination of the urine in estimating a cure.

**Ascending Infection of the Kidney.** The problem of how ascending infection reaches the kidney, as it frequently does sooner or later after ureteral injury or transplantation, has always been a puzzling one, and considerable experimental work has been done upon it. The three most likely routes for this ascending infection to follow are the ureteral lumen itself, the blood-stream, and the lymphatics. Of recent years, a number of investigations have tended to place the chief importance upon the last named method of propagation, by way of the lymphatics, and some work reported during the year by Sweet and Stewart<sup>2</sup> tends to confirm this idea. In their investigations these authors have had con-

<sup>1</sup> American Journal of Obstetrics, 1914, lxix, p. 499.

<sup>2</sup> Surgery, Gynecology and Obstetrics, 1914, xviii, p. 460.

stantly in mind the possibility of successfully transplanting the ureters into the bowel, and most of their experiments have been along this line; although their conclusions cannot, perhaps, be accepted in their entirety, at least until further confirmation of their results shall be available, a number of exceedingly interesting and suggestive points are brought out in their paper.

After demonstrating microscopically that when ascending infection occurs after direct implantation of the ureters into the sigmoid, microorganisms are found in the periureteral lymph spaces, with, however, pus in the ureteral lumen also, Sweet and Stewart tried the effect of cutting off all lymphatic communication between the source of infection and the kidney, at the same time maintaining the continuity of the ureteral lumen. This was accomplished by excising from the mid-portion of one ureter a piece measuring a few centimeters in length, and inserting in its place a section of rubber tubing (Fig. 95), telescoping this at each end into the ureter, and fastening the latter to the tube. The urethra was then ligated and severed, and a virulent colon bacillus culture injected into the bladder. Death of the animal occurred in forty-eight hours, and at autopsy the kidney on the non-operated side, with its ureter, were found markedly inflamed, whereas the ureter on the operated side showed signs of inflammation from the bladder up to the rubber tubing, but above appeared entirely normal, as did the kidney. In this case, therefore, in spite of the fact that a motile organisms had been used, it appeared that infection had extended only as far as the lymphatic system was intact.

In another series of experiments the above principle was reversed, the ureteral wall being placed in contact with infectious agents, which could not enter its lumen. This was done by freeing both ureters from the surrounding tissues for the greater part of their course, and dropping them into the lumen of the sigmoid through separate incisions a few centimeters long (Fig. 96). The bowel was carefully closed over the ureters, so that they should not be constricted, but their course from the bladder to the kidneys was not otherwise disturbed. Death occurred in one animal in about three weeks; at autopsy the bowel incisions were found nicely healed, and the intra-intestinal portions of the ureters enlarged, but intact; both kidneys showed hydronephrosis and pyonephrosis—the usual picture of ascending infection. Three other cases gave practically identical results, while in a fourth no kidney infection occurred. In these experiments it is evident that the infection must have reached the kidney through some other channel than the ureteral lumen, unless it might be supposed that organisms had penetrated the walls in the intra-intestinal portion; the normal appearance of the mucosa seemed to exclude this possibility, however.

In a third series of eight experiments, one ureter was ligated, severed close to the bladder, and the free end passed into the bowel through

the pancreatic duct, thus bringing the lumen into direct communication with intestinal contents, but excluding the serous coat of the ureter from contact with the intestinal wall (Fig. 97). At autopsy upon these animals there were no signs of hydronephrosis or hydro-

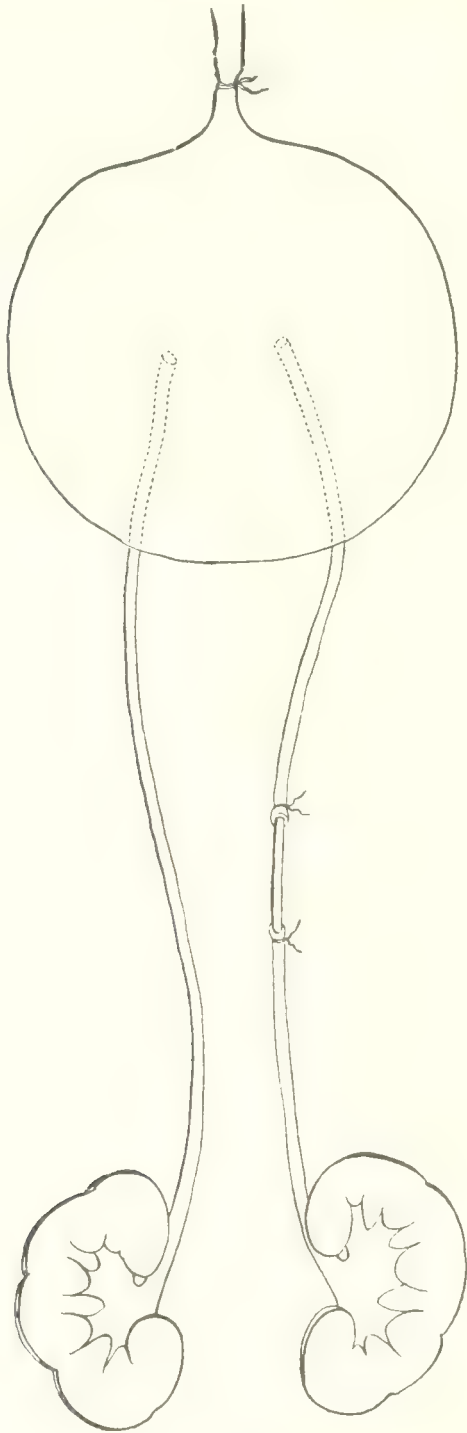


FIG. 95

ureter, nor of renal infection, notwithstanding the fact that in some of them there was a constriction of the ureter, with obstruction to the urinary flow.

Finally, the authors believe that any remaining doubt as to infection really ascending solely by the lymphatics must be abandoned in view



of the results of their fourth group of experiments, in which one kidney was exposed, its ureter doubly ligated near the pelvis and cut through, and the lower pole of the kidney then resected until the pelvis was opened, and anastomosed directly into some portion of the intestinal tract (Fig. 98). Various segments of the intestine, from the duodenum to the sigmoid, were chosen in different experiments, and in two instances both kidneys were similarly treated. In only 1 of 11 cases was any general kidney infection found at autopsy; for the most part, either the organ appeared entirely normal, or it showed some reaction in the immediate region of the lower pole only.

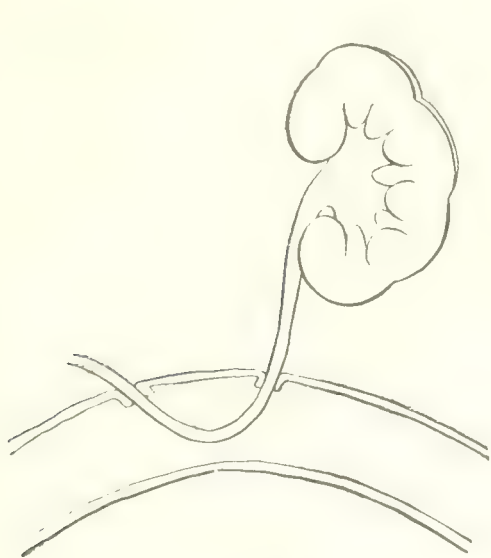


FIG. 96

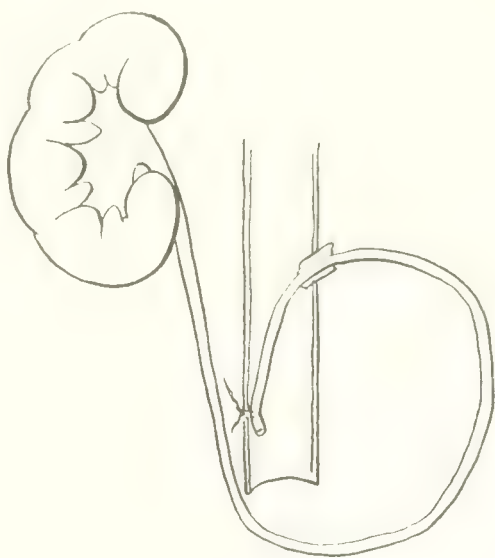


FIG. 97

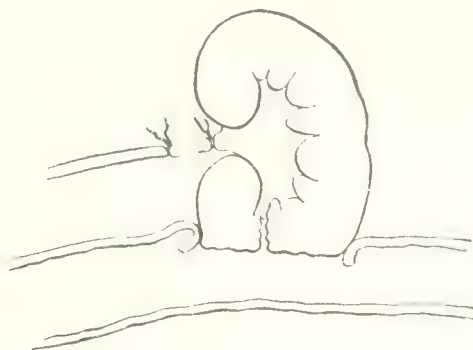


FIG. 98

Sweet and Stewart admit the possibility of *hematogenous* infection of the kidney from foci outside the genito-urinary tract, but they believe that the spread of infection, once it has entered the genito-urinary tract, is entirely *lymphatic*. The practical conclusion that they draw is that the cystoscopist must transfer his attention from the general question of cystitis to the particular one of the local lesions caused by cystitis, their extent and location, and the possibility of their effective local treatment. They do not believe, moreover, that the operation of

anastomosing the ureters with the bowel can ever be expected to hold out much promise, because of the ease and rapidity with which infection enters the lymphatic system of the former.

**Functional Tests in Kidney Disease.**—The desirability of some method by which it might be possible to estimate accurately the functional efficiency of the two kidneys, separately or together, is of course patent to anyone working at all in urology. Among the numerous tests that have been proposed, depending for the most part upon the injection, and subsequent elimination of some dye-stuff, the use of phenolsulphonephthalein, as originally suggested by Rowntree and Geraghty, has of late undoubtedly received the greatest amount of attention, and varying estimates of its efficiency have appeared in great number in the literature. In a paper presented at the last meeting of the American Medical Association, Braasch and Thomas<sup>1</sup> summarize their experiences with this test in over 600 cases at the Mayo Clinic, premising their remarks with the statement that phenolsulphonephthalein undoubtedly embodies many virtues which the various other tests lack, but is also representative of the underlying fallacies common to all functional tests, so that its use is illustrative of the practical value of such tests when applied to surgical conditions of the urinary tract.

Braasch is of the view, contrary to the general opinion, that deaths following renal surgery are much less frequently due to renal insufficiency than to infections and possible errors in surgical technique. It is a well-known fact, he says, that when one kidney is diseased the functional activity of the other may be temporarily reduced; the degree of this reduction may be so marked as to suggest an actual lesion, but is not necessarily commensurate with the actual destruction of tissue. The fundamental weakness of all renal functional tests as an aid to prognosis is that while they may show the degree of functional activity at the time of examination, one cannot determine from them what the functional capacity may be when the existing pathologic conditions are corrected. It has been Baasch's experience that the fundamental surgical principles and the clinical data, including a careful cystoscopic examination, are to be relied on in determining whether or not a patient should be operated on; in other words, if a surgical condition is present in one kidney, operation is indicated, provided there is a fair amount of normal urine in the catheterized specimen of the other side, and that the patient does not give evidence of the well-known clinical symptoms of renal insufficiency. The renal functional tests are of value, in his estimation, as an aid to differential diagnosis in some cases, but only to a limited degree as a prognostic aid, and then only when taken in conjunction with the other data mentioned above.

From the home of the phenolsulphonephthalein test, the Johns Hop-

<sup>1</sup> Journal of American Medical Association, 1915, lxiv, p. 104.

kins Hospital, comes an interesting report on some attempts made by Thayer and Snowden<sup>1</sup> to correlate the results obtained from this test during life with subsequent autopsy findings in a series of kidney cases. Fifty-six patients were studied clinically; at autopsy an attempt was made to classify the kidney lesions found from a purely objective standpoint, the result being the following tabulation:

Advanced chronic nephritis . . . . .	20
Moderate chronic nephritis . . . . .	6
Cloudy swelling associated with grave acute infection . . . . .	6
Severe acute nephritis . . . . .	1
Amyloid kidney . . . . .	1
Hypernephroma (unilateral) . . . . .	1
Chronic passive congestion (cardiac disease) . . . . .	20

In the cases of severe chronic nephritis there was a uniformly low phthalein output, this, when not interrupted by an acute terminal process, generally decreasing steadily up to the onset of uremia, and being nearly or wholly suppressed from a couple of days to a month before death. Acute terminal processes, often unsuspected clinically, were common, and were associated in some instances with a sudden diminution in the phthalein elimination where the previous percentage had not been low enough to appear menacing. Not once did the authors encounter a case of severe chronic nephritis with a good phthalein output.

The cases of chronic passive congestion (cardiac disease) gave variable results; with marked decompensation the phthalein output was often reduced to a mere trace in two hours, but with reestablishment of circulatory compensation it was rapidly restored. In the few cases of moderate chronic nephritis the phthalein excretion was uniformly reduced. All these were associated with some chronic passive congestion as well, but the elimination was lower than might have been expected from the congestion alone. In the case of acute nephritis, and the one of amyloid disease, the output was greatly reduced; the hypernephroma showed no elimination from the affected side (at autopsy practically no normal renal tissue was found), and an output of 17 per cent. from the sound side. The cases of cloudy swelling associated with acute infections showed in some instances considerable reduction in the phthalein.

From these studies, the authors state that they can entirely confirm the opinion of Rowntree and Geraghty that the phthalein test is of very considerable value in the diagnosis and prognosis of renal efficiency, especially in cases of chronic nephritis.

**Nephrectomy in Bilateral Renal Tuberculosis.** In a report from Zuckerkandl's Clinic in Vienna, Bachrach<sup>2</sup> says that in a series of something

<sup>1</sup> American Journal of the Medical Sciences, 1914, cxlviii, p. 781.

<sup>2</sup> Ztschr. f. Urol., 1914, viii, p. 98.



over 200 nephrectomies, the operation was deliberately done five times in spite of a definite diagnosis of bilateral tuberculous infection. The indications which have become established in the clinic for this procedure are: (1) When fever is being caused by mixed infection in the more involved kidney; (2) when the bladder is being greatly irritated by the discharge into it of large quantities of pus; (3) when the more affected kidney is so completely destroyed that its removal has no significance with regard to total renal function. The author emphasizes the importance, and also the difficulty, of arriving at an accurate diagnosis in these cases, and says that whenever for any reason a satisfactory diagnosis cannot be reached before operation, they have no hesitancy in exposing both kidneys by incision, so as to inspect them directly.

Bachrach considers blood-cryoscopy the most satisfactory method of determining the sufficiency of the less affected kidney in cases of bilateral involvement, since the bladder is usually extensively diseased, and ureteral catheterization is difficult or impossible. The theoretical objection that this test reveals only the combined functional value of both kidneys is obviated in his opinion by the fact that in advanced cases, which alone come into consideration, the worst kidney, whose removal is in question, is so far destroyed that its functional value is practically *nil*, so that any test of total renal activity is actually that of the less involved organ. It has been the experience of the Zuckerkandl Clinic that if the cryoscopic index of the blood is within the limit of safety determined by Kummel ( $-0.59$ ), the operative removal of the more diseased kidney appears justifiable as a *palliative* measure, notwithstanding the presence of infection in the organ of the opposite side. The author points out, however, that the operation under these circumstances is always a purely palliative one, there being, of course, no hope of attaining a permanent cure. Since in most cases, however, several years elapse between the involvement of the two kidneys, the one first effected may be completely destroyed before the disease is very far advanced in the other.

In the 5 cases reported by Bachrach, the extirpated kidney was invariably found to have been transformed into a large pyonephrotic sac, or reduced to a completely shrunken, atrophic bit of tissue, entirely devoid of secreting parenchyma. One of the patients died shortly after operation, and the other 4 were alive at the time of report, but in only one had as much as two years elapsed since the performance of the nephrectomy. In every instance there was an immediate and marked improvement in the general condition; the fever disappeared, the patients took on weight, and even the bladder symptoms cleared up to a considerable degree.

**Medical Treatment of Renal Tuberculosis.** So general is the consensus of opinion that renal tuberculosis is purely a surgical condition that we

do not often hear a voice raised in favor of its treatment by non-surgical means. As Vandeputte<sup>1</sup> points out, however, there are cases in which nephrectomy is contraindicated, because of bilateral involvement, poor functional activity of a supposedly uninvolved kidney, poor general condition of the patient, recurrence in the second kidney after one has been removed, etc. In such patients any treatment which will enable us to ameliorate or cure the condition is certainly to be welcomed, so that two cases reported by Vandeputte are of interest, quite satisfactory results having apparently been obtained in them without recourse to surgery.

The first patient was a woman, aged fifty-six years, who presented the characteristic symptoms of renal tuberculosis. Micturition was frequent and painful; there had been a gradual loss of weight and strength, and the right kidney was palpably enlarged, showing also distinct enlargement in a radiograph. Guinea-pig inoculation of the urine was positive. Operation was advised, but positively refused. Under the best hygienic treatment, rest, urinary antiseptics, etc., the patient was slowly but steadily losing ground. Following the work of Mantoux, Vandeputte thereupon began treatment with "paratoxin," a petroleum extract of biliary lipoids ("*extrait pétroléique de lipoides biliaires*"), 2 c.c. being given daily by intramuscular injection, and 10 c.c. by instillation into the bladder. Under this treatment there was gradual improvement; the hectic fever which had been present subsided, the urinary difficulties diminished, and the patient began taking on weight. In a few months the dosage and frequency of the injections were gradually reduced, and after six months these were stopped altogether, all symptoms having disappeared, and the guinea-pig test proving negative. Three months later the patient was apparently in the best of health, the only remnant of the former trouble being a slight pyuria, without demonstrable organisms, probably due to a catarrhal condition of the upper urinary tract.

The second patient was a man, aged forty-two years. His case presented the same general course and outcome as the above. Upon several occasions tubercle bacilli were demonstrated in the urine microscopically, and upon cystoscopic examination numerous characteristic ulcerations were seen around the right ureteral orifice. The patient was kept track of for two years after cessation of treatment, and remained in excellent health throughout that time. All the injections were well borne by both patients, and never caused any reaction. The author considers this treatment much simpler and easier of execution than that with tuberculin, but productive of as good if not better results. With the delightful indefiniteness characteristic of so much of the French literature, however, he says absolutely nothing as to the preparation of "para-

<sup>1</sup> Rev. prat. d. Mal. d. Org. Genito-urinaires, 1914, xi, p. 16.

toxin," nor are references given to the original work upon the subject. He also omits to say anything upon the question of how "paratoxin" is supposed to combat the tuberculous infection.

**Nervous Polliakuria in Women.** Schwartz<sup>1</sup> says that occasionally female patients are encountered who complain of a distressing desire to void urine very frequently, with other symptoms of vesical irritability, but all of whose symptoms disappear at each menstrual period. In many of these cases there are no discoverable evidences of anatomic changes, and Schwartz has, therefore, evolved the theory that the condition is due to irregularities in the sympathetic innervation of the bladder, consequent upon insufficient secretory activity of the ovaries. He believes that the ovarian secretion has a distinct influence upon the sympathetic nerves of the vesical region, and explains the absence of the symptoms referred to above during menstruation on the ground that the ovaries at this time are at the height of their activity, and are pouring into the circulation an increased quantity of secretion. In support of this assumption he states that he has seen a number of these patients in whom the administration of ovarian extract was followed by complete clearing up of the vesical symptoms, even between menstrual periods. He emphasizes the fact, however, that no case of polliakuria should be considered as falling in this group until cystoscopy and careful urinary examinations have demonstrated conclusively the absence of any local pathology.

**Bloodvessels of the Bladder.** A few years ago, Fromme<sup>2</sup> published some observations concerning the bloodvessels of the bladder, in which he stated his belief that the majority of the prominent vessels seen in the cystoscope are veins and not arteries, as is usually thought. Although this view has not been generally accepted, Bachrach<sup>3</sup> has recently made some studies which tend to confirm it. He injected the bladder in a number of cadavers, and found that while arterial branches run all through it, they are not nearly numerous enough to correspond to the vessels seen in the cystoscope. Injection of the veins, however, from any branch of the perivesical plexus immediately brings to view a very rich network throughout the vesical mucosa. In preparations in which both arteries and veins have been injected, the former are in places completely covered by the close network of the latter, so the author considers it practically certain that by far the greater number of vessels seen in the cystoscope are of venous and not arterial nature.

**Continuous Irrigation of the Bladder.** For the treatment of stubborn cases of cystitis, Holzbach<sup>4</sup> has devised a two-way catheter having an inlet tube about twice the size of the outlet (Fig. 99). The catheter

<sup>1</sup> Ztschr. f. Urol., 1914, 3 Beiheft, p. 346.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1913, p. 270.

<sup>3</sup> Ztschr. f. Urol., 1914, 3 Beiheft, p. 432.

<sup>4</sup> Münch. med. Woch., 1914, lxi, p. 1621.



may be either of glass or rubber as desired; once introduced, it remains without being removed for ten days or more as may be necessary. The outlet is connected to a tube leading to a bucket under the bed, the inlet to a vessel filled with boric acid or other solution. As this flows in faster than it flows out, the bladder gradually becomes filled, thus spreading out all the folds of the mucosa, and exposing every part of the wall; the vessel is then lowered to such a point that merely a moderate pressure is maintained, without overdisting the bladder, the solution being allowed to flow for an hour or so, or until two or three liters have been used. The inlet tube is then clamped, and the bladder allowed to empty itself and remain at rest for a time. Thus, without removing the catheter, periods of continuous irrigation and of rest are alternated according to the progress of the case. Any degree of dilatation of the bladder desired may be obtained and maintained by adjusting the height of the container. For the latter, the author has found a two-quart thermos bottle most satisfactory, placed upside down, and

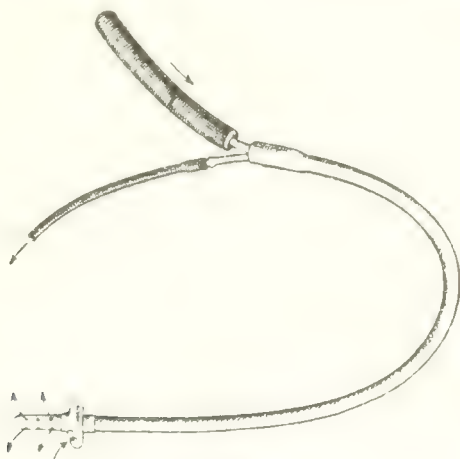


FIG. 99

provided with a double-bored cork for air-tube and catheter connection. In this way the irrigating fluid may be kept for hours at practically an even temperature.

In the treatment of especially stubborn cases of *pyelitis*, Holzbach has applied the same principle, introducing a two-way ureteral catheter into the renal pelvis, leaving it in place for thirty-six hours, and giving during this time two twelve-hour periods of continuous irrigation. In this instance, however, the outlet tube must not be of smaller calibre than the inlet, or tenesmus will result. The author says that for use in *pyelitis* cases the method is still in the tentative stage, but for bladder treatment it is of proved worth.

### MISCELLANEOUS TOPICS.

**Hemostasis in Pelvic Surgery by Means of "Coagulen."** During the past months a number of notices have appeared in the daily press con-

cerning a new blood coagulant, which is said to have been supplied in large quantities to the German army surgeons for the control of hemorrhage from bullet and shell wounds. This material, which was brought before the medical profession by Kocher and Fonio<sup>1</sup> under the name of "coagulen," is a powder obtained by fractional centrifugation of animal blood, and is supposed to contain in concentrated form the coagulating properties of the blood platelets; it is put on the market by a chemical firm in Switzerland. For use, it is freshly dissolved to 10 per cent. strength in normal salt solution, the somewhat cloudy fluid resulting being then sterilized by boiling for two or three minutes. After sponging free blood away from the bleeding area, the coagulen is squirted on from a syringe and covered by a compress for a few moments, or sponges soaked in the solution are held firmly over the bleeding surface until the hemorrhage is controlled.

From a report published by Albrecht,<sup>2</sup> it appears that this material may be of considerable service in gynecologic work. He says that he has found it most efficient in stopping the persistent, and at times exceedingly troublesome oozing which occurs from denuded areas in the pelvis after the release of inflammatory adhesions, and which at times is so difficult to control that gauze has to be left packed tightly down to the bottom of Douglas' pouch. In these cases, Albrecht has found a single application of the coagulen solution for a few moments sufficient to check hemorrhage completely, and to maintain efficient hemostasis. In other types of gynecologic hemorrhage, such as menorrhagia and metrorrhagia, and in abdominal work when bleeding came from definite bloodvessels, arteries or veins, he was unable to see any effect from it, however.

**Prevention of Intestinal Adhesions.** Some years ago Vogel<sup>3</sup> suggested the theoretical possibility of inhibiting adhesion-formation in the abdomen by the use of *hirudin*, on the ground that it might prevent the formation of fibrin in the peritoneal fluid. He never undertook any actual experiments, however, as he thought hirudin would be too toxic to be borne by the peritoneum. Recently, Schmiedt<sup>4</sup> has taken the matter up again, and has carried out an extensive series of investigations upon rats, guinea-pigs, rabbits, and cats. His method was to inject into the abdominal cavity a solution of 0.02 to 0.05 gm. hirudin dissolved in 50 c.c. sterile salt solution at body temperature, having previously irritated the peritoneum in some way, in order to stimulate the formation of adhesions. For this purpose various procedures were employed, such as rubber tubes, preparations of magnesium, iodine, etc. Since it takes injured serosa-endothelium from four to six days to regen-

<sup>1</sup> Mitt. a. d. Grenzgeb. d. Med. u. Chir., vol. xxvii.

<sup>2</sup> Zentrbl. f. Gyn., 1914, xxxviii, p. 1185.

<sup>3</sup> Deut. Ztschr. f. Chir., p. 1902.

<sup>4</sup> Arch. f. klin. Chir., 1914, civ, p. 1031.

erate, it was found necessary to repeat the hirudin injections daily for at least that length of time, this constituting the main difficulty in the entire investigation from the technical standpoint. In some instances the injections were made through the drainage tubes introduced for the purpose of producing adhesions, but this was found unsatisfactory because of infection which often followed. Merely picking up a fold of abdominal wall and thrusting a hypodermic needle through the skin frequently resulted in puncturing the intestine, and it was, of course, impracticable to reopen the original incision every day for the purpose of obtaining access to the abdomen. The author eventually devised a fairly satisfactory technique, however, consisting in the introduction of a short rubber tube directly beneath the skin, reaching from its under surface through fascia and muscle, down to but not through the peritoneum, the latter being almost closed about its lower end. By puncturing, with a hypodermic needle, the skin over the outer end of this tube (which it closes like a drum-head), and injecting solution into the tube, Schmiedt claims that he is able to secure a gradual dissemination of the hirudin through the abdominal cavity, without any danger of infection, intestinal injury, or other complications.

The results of the very numerous experiments undertaken showed a very marked influence of the hirudin in inhibiting the formation of adhesions in animals treated with it as compared to controls. Numerous illustrations accompanying the original article show the difference between the often dense adhesions produced in the latter as compared with the few delicate, veil-like bands, or total absence of any at all in the hirudin animals. Given in the doses and manner described, the drug did not produce any toxic or other deleterious effects, nor was there any noticeable diminution in the coagulability of the blood. As to the applicability of this work to clinical surgery, however, Schmiedt states that it is yet in a too purely experimental stage to be able to venture any definite opinion. There are a number of problems which must first be met, the chief of which is, of course, the necessity for repeatedly introducing the drug into the peritoneal cavity. Whether the subcutaneous drainage tube, as used in the animal experiments, would be satisfactory in the human subject remains to be seen, but its use would at least form a complication of considerable moment to an abdominal operation. Very considerable quantities of hirudin would have to be used, and as yet practically nothing is known as to how much the body can stand with impunity (to say nothing of the exceedingly high cost of this substance, a point not mentioned by the author). In spite of these technical difficulties, however, the work furnishes an interesting contribution to an extremely important, and as yet almost completely unsolved problem in abdominal surgery, and may possibly result in great benefit, if the author's belief shall prove correct, that further investigations may point the way to the practical application of some portion of it in the operating room.



**Intravenous Administration of Gonococcus Vaccine.** In working with intramuscular injections of gonococcal vaccine for diagnostic purposes, Moos<sup>1</sup> says that he has had such inconstant and unsatisfactory results that during the past year he has been trying the intravenous method, following the work of Bruck and Sommer, who reported very favorable results from this method with males. Working with "arthigon," a commercial vaccine, Moos has found the best average dose for use with women to be about 0.05 c.c.; this is brought up to a volume of 0.5 c.c. with sterile salt solution, and injected into an arm vein, the patient being kept in bed for one or two days, and hourly or two hourly temperatures being taken during this time. In both positive and negative cases the injection was usually followed by severe headaches, and in some instances by nausea and general malaise. If a temperature rise occurred, it usually came on within half an hour after the injection, and had disappeared again by evening, the injection always being given early in the day.

As a result of tests in 113 cases, Moos has decided that the intravenous administration of arthigon is more reliable for diagnostic purposes than the intramuscular, but that while it is of considerable clinical value it is by no means so constant that final conclusions can be drawn from it. In about 86 per cent. of the cases in which gonorrhea was known to be present there was a rise of  $1.5^{\circ}$  or more, in over half the rise amounting to over  $2^{\circ}$ . The author therefore considers that, following an injection of 0.05 c.c. of arthigon, a temperature rise exceeding  $1.5^{\circ}$  speaks for the *probability*, and exceeding  $2^{\circ}$  for the *very strong probability* of a gonorrheal process. (Reference here is, of course, to the centigrade scale.)

From a therapeutic standpoint, the results were less satisfactory. The use of increasing doses of arthigon, advancing by 0.02 c.c. at a time up to 0.5 or even 1 c.c., given intravenously, resulted in marked improvement of only 19 per cent., and slight improvement in 84 per cent. of 47 cases. Except for 3 patients with uncomplicated gonorrhea, all these women had unilateral or bilateral tubal involvement. It was only in the recent cases that any noticeable results were obtained, the older the process the less being the effect of the treatment, and pyosalpinges of long standing not being influenced at all. No effect could be noticed in the way of causing a disappearance of gonococci from the cervical or ureteral secretions, so that on the whole Moos concludes that so far as therapeutic effects are concerned, the intravenous administration of gonococcal vaccine has no advantage over the intramuscular, and practically none over the older methods of treatment, by which in recent cases as good results can usually be obtained as are here recorded.

**Bactericidal Powers of Iodin on the Skin.** In view of the extensive use of iodine solutions for the purpose of sterilizing the skin in abdominal and pelvic surgery, it seems strange that only comparatively few

<sup>1</sup> Monatschr. f. Geb. u. Gyn., 1914, xxxix, p. 333.

reports have appeared of attempts to determine accurately just how much bactericidal property these preparations have. A study of the results obtained under actual clinical conditions by Bovée<sup>1</sup> is, therefore, of some interest.

Bovée's method of preparing the abdominal skin is as follows: Two paintings with a 3.5 per cent. alcoholic solution of iodine are given from fifteen minutes to an hour and a half apart, followed by thorough scrubbing with a strong sterile solution of sodium hyposulphite, until the iodine color has entirely disappeared. In a series of 10 cases, four tests were made from each: (1) A small amount of the hyposulphite solution was put into a bouillon tube as a control; (2) scrapings from the skin two minutes after applying the iodine were put into bouillon tubes; (3) the same, after five minutes; (4) skin scrapings from the same field after scrubbing and decolorizing with hyposulphite were treated in the same manner. All 40 tubes remained completely sterile after five days' incubation.

In another series of 12 cases, a narrow strip of skin was cut from the median line of the abdomen when making the initial incision, dropped at once into a quart of normal salt solution, and sent to the laboratory. In 5 of these cases a vigorous culture of *subtilis* was rubbed into the skin about fifteen hours before operation, and the area then covered with sterile dressings until time to apply the first coat of iodine. In all instances cultures were made from the excised strip of skin, and from the salt solution in which it had been placed; *staphylococcus albus* or molds developed in several of the specimens, but these are considered by the author (and also by the bacteriologist who carried out this portion of the work) to have been undoubtedly contaminations, acquired during transport to the laboratory. In most of the cases which had been treated with *subtilis*, this organism developed in the cultures, but only after twenty-four to thirty-six hours, apparently indicating that all the *active* organisms had been killed, but that the spores, which are known to be exceedingly resistant, had escaped.

As a result of this work, Bovée concludes that iodine is an exceedingly satisfactory skin disinfectant, from the theoretical as well as from the practical standpoint. He suggests that the manner of its application is of considerable importance, however, and advocates putting on a good thick coat the first time, so that it may penetrate deeply into all the folds and depressions, since if a light coat is applied it may not penetrate thoroughly, but on drying will form a thin scum, which will prevent the satisfactory penetration of subsequent coats. He does not think the strength of the preparation used is of very great moment, and says that he has found his 3.5 per cent. solution just as satisfactory as much stronger ones.

<sup>1</sup> American Journal of Obstetrics, 1914, lxx, p. 12.





# DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE THYROID GLAND, NUTRITION, AND THE LYMPHATIC SYSTEM.

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## THE BLOOD.

**Hemokonia: The Blood Dust of Müller.** The nature and significance of the blood dust has been the subject of study and discussion for a long time. The studies of Neisser and Bräuning showed that, after the ingestion of a moderate amount of fat, the blood serum became turbid and that this turbidity was due to a fine suspension of hemokonia. Twelve hours after the ingestion of an ordinary meal, the blood-serum is practically clear. Jeannin and Levant<sup>1</sup> use these facts as the basis of testing the functional integrity of the liver. The test is made by examining the blood after fasting, and again three and one-half hours after the ingestion of 50 grams of butter on bread. At this time, if the liver functions are normal, the hemokonia show up in large numbers, the microscopic preparations being filled with the small particles, an appearance which might be compared to the "milky way," and the field is fairly alive with the brownian movements of these refractive particles. The authors report two cases in which they applied this alimentary lipemia test to women with severe jaundice following childbirth. There were scarcely any hemokonia to be observed in the blood in the first case, and the gravest prognosis from this was confirmed by death on the seventh day after delivery. There were no hemorrhages and no nervous phenomena, but the jaundice was extremely severe and the liver was found to be much degenerated, showing streptococci in some of the lobules. The symptoms were not sufficiently severe at first to suggest a fatal outcome, but the absence of blood dust in the fresh blood after the test compelled the gravest prognosis. The jaundice was mild in the second case and there were no threatening nervous or hemorrhagic disturbances. The woman had been in labor for three days, with breech presentation, the temperature being 38° C., and pulse 120. After the application of the test in this case only fifteen or twenty of the blood-dust particles were to be found in the preparation.

<sup>1</sup> Arch. Mens. d'Obstétrique et de Gynéc., April 3, 1914.

and the patient died sixty hours after extraction of the dead fetus. In three other cases the women presented jaundice in the course of pregnancy. One had very severe catarrhal jaundice, with clay-colored stools, and seemed to be in a bad way, but the hemokonia were found in normal numbers. The woman recovered and the pregnancy proceeded normally to term. In two other cases there was subjaundice; the women did not vomit much; the diacetic odor of the breath was not at all pronounced, but the small number of hemokonia in the blood gave the warning that the women were on the way to pernicious jaundice and prompt interruption of the pregnancy seemed their only salvation.

From Chvostek's Clinic, in Vienna, Weltmann<sup>1</sup> reports 105 cases of various affections in which the test for blood dust, or hemokonia, was applied. He tabulates the findings at the first, second, third and fourth hours after the butter test meal. Classifying them according to the proportionate content of blood dust showed that the cases with little, or no, blood dust after the ingestion of butter were all cases of liver disease. A delay in the appearance of blood dust in the serum after the butter test-meal indicates disturbance in the functioning of the liver, while the complete absence of blood dust or the presence of very small proportions seem to be a sign of more or less complete obstruction of the biliary passages.

Nobecourt and Maillet<sup>2</sup> have made a study of the blood dust in the serum of forty-two infants of from one to nineteen months of age suffering with various affections, and conclude that a large proportion of these cells is generally, but not always, a favorable sign; while a progressive reduction in their numbers or their constant absence from the serum is a bad sign.

**Blood Platelets.** The blood platelets have aroused considerable interest of late years and there have been numerous investigations<sup>3</sup> carried out with the idea of determining their origin, nature, and functions. The relation of these platelets to hemorrhagic disease is fairly well established, and of late there seems to be a decided tendency to connect them with the processes of immunity.

Webb, Gilbert and Havens<sup>4</sup> have conducted studies on these bodies, the work consisting of a series of platelet counts in normal adults at sea level and at an altitude of 6000 feet, a series in tubercular patients and tuberculous animals at various stages, and several series of experiments relative to the possible functions of blood platelets. They arrived at the conclusions that these bodies are consistently increased in the tuberculosis of man and guinea-pigs, that at an altitude of 6000 feet their numbers are increased in the circulating blood of these animals.

<sup>1</sup> Wien. klin. Woch., July 9, 1914.

<sup>2</sup> Bulletins de la Société Pédiatrie, May 5, 1914.

See PROGRESSIVE MEDICINE, June, 1913, p. 207, and June, 1914, p. 303.

<sup>4</sup> Archives of Internal Medicine, November, 1914.

From these studies, it would appear that the blood platelets either contain, or supply, opsonin. It is suggestive that when a small amount of a thick emulsion of platelets is added to a lethal dose of virulent tubercle bacilli, infection would seem to be either modified or prevented. When serum, however, is added to this mixture no evidence can be shown of any change in the infection produced from that of the controls.

The principle of fortifying the immunity processes through the injection of platelets has been practically carried out by Dimond<sup>1</sup> in a large number of cases. He notes that though good results are obtained through the administration of small doses of the platelets and their plasma (1 to 5 c.c.), yet he has in particular cases given as much as 30 to 40 c.c. by injection into the connective tissues between the shoulder blades. In an experience of many hundreds of injections, varying from 1 c.c. to 40 c.c. in amount, he has seen no untoward results aside from a slight hyperemia of the skin immediately around the puncture which clears up in from twenty-four to thirty-six hours. This hyperemia is accompanied by a slight sensation of itching, but the patients have never complained of any pain as an immediate or after-result of the injections.

When vaccines are administered, either with the platelets, or after sensitization by means of the platelets and their plasma, more definite local signs are the result; but never so marked, or so intense, as when the vaccine alone is injected. The author has treated a large number of acute and chronic pulmonary cases, as well as numerous cases of secondary infection in phthisis, by the injection of platelets. He has found that for the organisms noted below, the most suitable time for isolation of the platelets after the injection of the vaccine is, as a rule, as follows: *Diplococcus pneumoniae*, platelets should be withdrawn on the fifth day after injection; *Micrococcus catarrhalis*, platelets should be withdrawn on the third day after injection; *Friedländer's bacillus*, platelets should be withdrawn on the second day; *Bacillus influenzae*, platelets should be withdrawn on the second day after injection; *Streptococcus pyogenes*, on the third day; *Bacillus septus*, on the sixth day; and *Bacillus pertussis*, on the third day. Regular estimations of the opsonic index in certain of these cases have demonstrated that when the platelets are withdrawn after the above interval following the vaccine injection, the best immunizing response is obtained.

A number of papers have appeared during the year on *the relation of the blood platelets to the arrest of hemorrhage*. Fonio<sup>2</sup> obtains blood platelets from animals by fraction centrifuging, sterilizes by means of heat and then desiccates them. The dried platelets may then be dissolved as needed and injected to arrest hemorrhage. This preparation has been in use at Kocher's clinic for over a year, and Fonio analyzes

<sup>1</sup> British Medical Journal, November 14, 1914.

<sup>2</sup> Mitteilungen aus der Grenzgebieten der Med. u. Chir., 1914, xxvii, No. 4.



their experience with it, showing that it answers the physiological requirements better than any other method of arresting hemorrhage except the transfusion of blood. He notes that it has the advantage over the latter in that it supplies only the one element needed, and that the doses can be graduated. This method is still in the tentative stage. From the various bi-effects observed, it is clear that the best method of administration has not yet been evolved. The pulse and temperature increased regularly after intravenous injection, and at times pains in the cardiac region, vertigo, flushing of the face and neck, and headache were noted. These bi-effects were much reduced by administering part of the solution subcutaneously. The greater the loss of blood by the patient, the smaller the dose required.

**Erythrocytes.** Callison<sup>1</sup> has recommended an easily prepared diluting fluid for counting the red cells. He complains of Toisson's fluid as being difficult to prepare and as a medium which grows molds forming precipitates. Hayem's solution, he says, has no added coloring matter and that therefore the cells are not brought into clear relief; and also with this fluid it is difficult to differentiate the white from the red cells. The solution which he recommends is easily prepared, keeps permanently, and has all the advantages of either Toisson's or Hayem's solutions. The formula is:

Loeffler's alkaline methylene blue . . . . .	1.0 c.c.
Liquor formaldehyde . . . . .	1.0 c.c.
Glycerin . . . . .	10.0 c.c.
Ammonium oxalate (neutral) . . . . .	1.0 gram.
Sodium chlorid . . . . .	2.5 grams.
Distilled water . . . . .	90.0 c.c.

The various ingredients are added to the distilled water and allowed to stand until solution occurs. After being filtered, the preparation is ready for use. This gives a diluting fluid of a specific gravity of about 1.045, sufficiently heavy to prevent a too rapid sedimentation of the red cells.

**MORPHOLOGY.** Bishop<sup>2</sup> reports the finding of elliptical erythrocytes in a patient with a history of acute appendicitis. No lesions of the heart, kidneys, or lungs were demonstrable. Operation two hours after admission to the hospital revealed a gangrenous appendix and a small amount of sero-purulent fluid in the abdominal cavity. Recovery was uneventful, the patient being discharged on the tenth day after operation. While the patient was in the hospital, the author made a careful study of the blood. Elliptical erythrocytes were found to predominate, the proportion being about 75 to 80 per cent. The degree of their elliptical form varied considerably, some showing only slight deviation from the

<sup>1</sup> Journal of the American Medical Association, April 4, 1914.

<sup>2</sup> Archives of Internal Medicine, September, 1914.

normal, while others were markedly elongated. The resistance of the red cells to salt solution was found to be normal, and only 3 per cent. of reticulated cells were found with vital staining. The Wassermann reaction was negative. Thinking that the condition might be congenital, Bishop obtained specimens of blood from a sister of the patient and this was found to show a similar condition. The blood of other members of the family, a second sister, her father, and two of her children (both boys) was found to have normal erythrocytes. Unfortunately, the mother of the patient was not living. To exclude the possibility of some chronic poisoning, coal gas or other chemical, the blood of all the persons living in the same house with this family was examined and found to be normal. For eight months this brother and sister were kept under observation, and, while they remained in perfect health and showed a normal number of red cells and normal hemoglobin percentage, the same unvarying deformity of the red cells was demonstrable. The only similar case on record which the author could find was one observed by Dresbach.<sup>1</sup>

**THE COLOR INDEX.** Meyer, Strassburg and Butterfield,<sup>2</sup> from their studies of the color index, conclude that the existence of a high color index in pernicious anemia has been established with exact methods. The high color index is due to an increase in the oxyhemoglobin of the erythrocytes. A quantitative study of the light absorption shows that oxyhemoglobin alone and no other derivative of hemoglobin is present in the blood of all cases of pernicious anemia with a high color index.

The color index of normal human blood varies within the narrow limits of 0.9 to 1.1. The average total hemoglobin concentration of normal defibrinated human blood is in the neighborhood of 16 grams in 100 c.c. The color of the red blood corpuscles is best explained by the principle of dichromatism as applied to the absorption spectrum of oxyhemoglobin.

**FRAGILITY.** Iurevich and Rosenberg<sup>3</sup> have carried out experimental studies on rabbits in which they showed that up to one-half the total amount of the animal's blood could be withdrawn from the body, collected in test tubes containing 1.5 per cent. solution of sodium citrate, washed two or three times by means of normal saline solution and centrifuged, then returned to the animal's circulation through a vein in the ear without any noticeable destruction of the red cells taking place and without the appearance of any appreciable morbid symptoms. It is thus shown that the stability of the red cells is very great, and, in cases of toxemia, when the blood is saturated with toxic substances, blood letting, followed by reintroduction into the vascular system of the blood that has been removed and washed, ought to be of great

<sup>1</sup> Science, 1904, xix; 1905, xxi.

<sup>2</sup> Archives of Internal Medicine, July, 1914.

<sup>3</sup> Russk. Vrach. St. Petersburg, 1914, xiii, 18.

clinical value. The authors are now conducting experiments along these lines.

In a series of experiments carried out on dogs and rabbits, Krumbhaar<sup>1</sup> found that rapid intravenous injection of distilled water in amounts equal to from 2 to 3 per cent. of the body weight, or more, will cause, in the dogs, transient hemoglobinuria and albuminuria. Lengthening the duration of injection time from five to forty-five minutes is without noticeable effect, though a much slower injection might give different results. Hemoglobin-stained urine usually appears in the bladder catheter in from twenty-five to thirty minutes after the beginning of the injection. The hemoglobinuria lasts approximately from four to sixteen hours, depending on the severity of the hemolysis. Much smaller amounts (as low as from 0.4 to 0.6 per cent.) are sufficient to cause a noticeable hemoglobinemia without hemoglobinuria. Hemoglobinemia appears in from two to four minutes after the beginning of the injection, and may last twenty-four hours. In doses that just fail to cause hemoglobinuria, albumin and bile may appear in the urine the next day. No noticeable anemia is caused, but there is a temporary decrease in the normal resistance of the red cells.

Brigland<sup>2</sup> describes a *method of determining the fragility of red blood corpuscles* toward the hemolyzing agent saponin. From his investigations with this method, he concludes that human red blood corpuscles show a constant degree of resistance toward saponin hemolysis. The serum is markedly protective against the action of saponin, but this power varies within certain limits. The corpuscles of different animals show marked variation in their fragility. In jaundice, the resistance of the washed red blood corpuscles is markedly diminished, while the protective action of the serum is markedly increased. This latter result is not due only to the antagonistic action of saponin and bile salts. It may be of interest here to note that G. D. White<sup>3</sup> has found that the addition of small amounts of sodium taurocholate to the blood serum gives rise to hemolysis.

Brigland further noted that in all the anemias, except pernicious anemia, the corpuscular resistance is increased. In pernicious anemia it is normal or slightly diminished. In splenic anemia there is great increase in corpuscular resistance, and the serum appears to have no protective reaction. In the anemia found in chronic disease, syphilis, tuberculosis, scurvy, amyloid disease and myelogenous leukemia, and in a case of splenectomy, there was an increased corpuscular resistance. In diabetes the corpuscular fragility is normal, while the serum in some cases is abnormally protective. In exophthalmic goitre and paroxysmal hemoglobinuria, the corpuscular fragility is normal. In polycythemia

<sup>1</sup> Journal of the American Medical Association, March 28, 1914.

<sup>2</sup> Quarterly Journal of Medicine, July, 1914.

<sup>3</sup> Lancet, February 9, 1914.



the resistance is increased. High temperatures appear to increase the fragility of the red cells.

May<sup>1</sup> has carried out extensive studies of the hemolysis produced by a 1 to 10,000 solution of saponin in a 9 to 1000 solution of salt. According to the author, the reaction depends on the cholesterin-lecithin content, and hence the corpuscles present a normal resistance to saponin in diseases which do not affect the lipid in the blood, such as pernicious anemia and Bright's disease.

Antonelli<sup>2</sup> has investigated the blood of 10 cases of anemia from various causes. He found that the cholesterin content of the blood serum varied from 0.21 pro mille to 1.56, while the hemoglobin content ranged from 18 to 80 per cent. From these studies he was led to believe that there was no connection between the cholesterin-content and the degree of anemia, nor between the cholesterin-content and the fragility of the red cells.

**Leukocytes.** Miller<sup>3</sup> has made an extensive study of the differential leukocyte count in normal individuals. He found that the differential formula was subject to relatively wide variations within the normal. This fact, he says, must be considered in the interpretation of studies made on the blood of individuals presumably suffering from abnormal conditions. The interpretation of any differential count according to the author should be based on (a) a knowledge of that particular individual's normal blood picture when possible; (b) the average values for the locality in which that individual resides; (c) a consideration of those factors peculiar to the individual which might modify that particular blood. Differential leukocyte counts should always be reported in terms both of percentage and absolute numbers per cubic millimeter, and, in all cases in which it is possible, more than one differential count should be made, especially in borderline cases in which slight changes are to be regarded as of diagnostic or prognostic value. The tendency to ascribe a diagnostic value to lymphocytosis, the author believes is probably overdone. Only when the mononuclear elements constantly exceed the average percentage, absolute values and upper limits of variation (35 to 40 per cent.) for the community, and when all modifying factors are considered, should one attempt to draw valuable conclusions from the figures obtained.

Huhle<sup>4</sup> is in entire accord with Miller's views regarding lymphocytosis. He examined the blood in 110 cases of nervous disorders, some of which also showed the presence of organic disease, including diseases of the liver and heart muscle, infectious diseases, blood affections, and metabolic disturbances. Excluding those cases in which lymphocytosis was to be expected, he found it present in 45 cases without

<sup>1</sup> *Annals de Méd.*, June, 1914.

<sup>2</sup> *Policlinico*, Rome, August, 1914.

<sup>3</sup> *Bulletin of Johns Hopkins Hospital*, October, 1914.

<sup>4</sup> *Deut. Archiv f. klin. Med.*, 1914, cxiii, 5 and 6.

any apparent reason. He is of the opinion that entirely too much importance is attached to it in diagnosis. In an adult free of fever, after repeated examinations of the blood we should pay no attention to a lymphocytosis of less than 35 to 40 per cent. This would exclude many cases now regarded as exhibiting a lymphocytosis, and a new basis of valuation would have to be established for the condition.

Some interesting observations on the effect of high altitudes on the constituents of the blood, especially the red cells and hemoglobin, were reported last year in these pages. Staines, James and Rosenberg<sup>1</sup> have made careful studies regarding the effect of altitude on the leukocyte count, especially the lymphocytes. Differential counts were made on 100 male students of Cornell Medical College in New York City, and on 100 male students of Colorado College in Colorado Springs. Each student was ascertained to be in normal health and between the ages of twenty and thirty. All counts were taken at 12 o'clock, noon, before lunch and when no strenuous exercise had been taken during the morning. The technique used in New York was identical with that used in Colorado, every detail having been previously arranged. In every instance at least 200 cells and more often 300 cells were counted, and at the same time a total leukocyte count was made. As a result of this work the authors are led to conclude that it is certainly safe to assert that at an elevation of 6000 feet the larger lymphocytes are absolutely increased in circulating blood by at least 20 to 30 per cent. in both man and the monkey. The basophilic mononuclear elements in the blood of man at sea level are approximately 34 per cent. and at 6000 feet are about 42 per cent. The total white blood cells per c.mm. are approximately the same at sea level and at an altitude of 6000 feet, namely, about 7500. The total polymorphonuclear cells diminish in the exact proportion in which the mononuclear cells increase. The red corpuscles increase by 22 per cent. at an altitude of 6000 feet.

Gullbring<sup>2</sup> has carried out extensive researches on the relation of the leukocytes to the viscosity of the blood. The results of these researches show that there is a regular ratio between the number of polymorphonuclear leukocytes and the blood's viscosity. The viscosity increases as the number of polymorphonuclear cells increases. His investigations included tests carried out on 201 patients. In some cases the tests were made after the injection of sodium cinnamate, gelatin, and different drugs. Other cases were investigated while on different diets. Cases of syphilis, nephritis, exophthalmic goitre, leukemia, and pernicious anemia were also tested.

Hoessli<sup>3</sup> reports the observation that leukocytosis may occur with intraperitoneal hemorrhage. He found 30,000 leukocytes in a previously

<sup>1</sup> Archives of Internal Medicine, September, 1914.

<sup>2</sup> Beiträge zur Klinik der Tuberkulose, 1914, xxx, No. 1.

<sup>3</sup> Mitteilungen a. d. Grenzgebieten der Med. u. Chir., 1914, xxvii, No. 4.

healthy young woman suddenly taken with symptoms suggesting rupture of a tubal pregnancy, which condition was confirmed on immediate operation. On the tenth day after operation the leukocyte count was 8000. He cites three cases of a similar character in which, within twenty-four hours after the first symptoms, the leukocytes numbered from 15,000 to 19,000. Extra-uterine pregnancy was regarded as probable in all but one case, in which the symptoms and an intact hymen spoke for appendicitis. The condition, however, proved to be a ruptured blood cyst in the right ovary. From experiments carried out by the author on animals, the fact was confirmed that a sudden large influx of blood into the peritoneum is liable to induce high leukocytosis for about twenty-four hours, even in the absence of inflammation.

**EOSINOPHILE CELLS.** Herrick<sup>1</sup> has made a study of the action of atropin on the eosinophile cells. He found that this drug, in ordinary non-toxic doses, exerts no striking influence on the eosinophiles of the guinea-pig. If given in toxic doses, resulting in loss of weight and other signs of disturbed nutrition, and particularly when such doses are repeated as often as every twelve hours, there is a diminution in the number of these cells, and the eosinophilia which follows interval injection of serum (anaphylaxis) is diminished or absent. It is probable that this effect of atropin is not specific, but is the result of depression of a highly specialized function by the general effect on nutrition of large amounts of a strong poison.

Eosinophilia has been noted in neurasthenia and certain nervous diarrheas (Nageli). Leopold<sup>2</sup> reports the observation of its occurrence in chorea. The author made a study of the blood in 20 cases of this affection. His results seemed to show that among cases in the first attack or non-recurrent cases, the eosinophilia was *nil* or slight; while in the distinctly recurrent cases the proportion of eosinophiles ran up to 13, 15, and 16 per cent.

**Leukemia.** The tendency of the year in the literature on the leukemias is to connect these diseases with infectious processes, to look upon them as an infection *sui generis*, or to regard them as a sequel or accompaniment of established infections.

**ETIOLOGY.** v. Hansemann<sup>3</sup> puts forth the hypothesis that leukemia is a stage of some infectious process in the same sense that the gumma is a stage of lues. He is convinced that some infectious disease is the forerunner of leukemia and allied conditions. Acute leukemia in itself is the clinical picture of an acute infection or intoxication. Many of its manifestations resemble those of severe diphtheria and other septic diseases, but the differences must be emphasized, the non-contagiousness, and the impossibility to date of transmitting the disease to animals.

<sup>1</sup> Archives of Internal Medicine, May, 1914.

<sup>2</sup> New York Medical Journal, August 1, 1914.

<sup>3</sup> Berl. klin. Woch. January 5, 1914.



He explains the non-contagiousness in the same manner that the non-contagiousness of the gumma is explained. There is much to sustain the hypothesis, according to the author, that the tonsils are generally the primary seat of the infectious process. Hansemann urges all to investigate the previous history in every case of leukemia so that a composite picture may be obtained as to the events passed through before the onset of the leukemia. If these data are forwarded to him, he will undertake to compile and compare them, and in this way he thinks much light may be thrown on this disease.

Citron<sup>1</sup> reports two cases of acute leukemia, the first of which clinically showed the picture of a severe hemorrhagic diathesis, hemorrhage from the mouth, and death from progressive weakness in six months. The man had been a vegetarian for many years and the diagnosis had been scorbutus until examination of the blood showed a typical micro-myeloblast leukemia. The second case was likewise one of myeloblast leukemia. The blood cells in this case were of the leukoblastic type of myeloblast described by Pappenheim. The bone marrow in this case showed signs of mixed-cell leukemia. In a concluding critical consideration of the etiology of leukemia, the author believes that the disease is infectious in nature and that it develops when the unknown virus attacks a constitutionally inferior organism, such as one of the thymolymphatic status, on an organism that has been artificially placed in a less resistant state by exposure to the Röntgen ray. The mobilization of leukocytes is the resistance of the organism to the invading virus, and it is a mistake to attempt to destroy the leukocytes, unless they are mobilized to such an extent as to be directly mechanically injurious.

Ellermann<sup>2</sup> has carried out experiments with the virus of chicken leukemia. He inoculated eleven chickens (first generation) with an emulsion of the organs of a chicken affected with leukemia. Chicken No. 7 of this generation developed a myelocytic form of the disease. Ten chickens (second generation) were inoculated with virus from chicken No. 7 of the first generation. Chicken No. 22 (second generation) developed pseudoleukemia, and chicken No. 24 of this generation developed leukemia. Ellermann concludes from this work that chicken leukemia holds no relation to tuberculosis. The viri of these two diseases can be separated by filtration. The virus of chicken leukemia belongs in the category of invisible filterable microbes. He points out that, in his experiments, chicken No. 7 (first generation) showed large deposits of myelocytes in the organs, which condition is designated "myelosis," while in a chicken of the second generation twenty-two, enormous infiltrations of lymphatic cells were found, "lymphomatosis." These same conditions are found in the leukemia of man; at times new growths of myeloid tissue, at times new growths of lym-

<sup>1</sup> *Deut. med. Woch.*, March 26, 1914.

<sup>2</sup> *Zeitschr. für. klin. Med.*, 1914, lxxix, Nos. 1 and 2.

phatic tissue. It has further been shown that the blood picture may be of two different types, a myeloid and a lymphatic. The myeloid type, which is distinguished by numerous myelocytes and transitional cells, appears in conjunction with out-spoken "myelosis" of the organs. The lymphatic type corresponds throughout with the lymphatic leukemia of man, in that the blood picture consists entirely of small and large lymphocytes. It has been shown that the type in one generation may be myeloid, in the next generation lymphatic, or that in the same generation myeloid as well as lymphatic types may appear. From this fact that myeloid and lymphatic cases may develop from the same strain of virus, it is probable that both forms of leukemia in man are one and the same infection. The author's conclusions are that chicken leukemia is a specific infectious disease having nothing to do with tuberculosis, that its virus is filterable and that the infection sometimes leads to the myeloid type of the disease and sometimes to the lymphatic.

Steel<sup>1</sup> has isolated, from the lymph nodes of a case of lymphatic leukemia and also from those of a case of Hodgkin's disease, a diphtheroid bacillus similar in its morphological and cultural characteristics to the organism described by Negri and Micremet, Bunting and Yates, and Billings and Rosenow. He has been unable to define its relationship to these diseases but is carrying out further studies on the subject.

Brown<sup>2</sup> reports a case of acute lymphatic leukemia of extreme interest from the etiologic standpoint. The patient, a boy, aged fourteen years, was seen in consultation. He had enjoyed good health previously. Four weeks before he had been given a prophylactic dose of antitetanic serum for a slightly infected nail puncture of the foot. Over two years ago he had taken a similar dose of antitetanic serum for a similar nail puncture of the foot. Within thirty-six hours after the second dose, he developed a violent urticaria, with large wheals and erythema, and with vomiting and fever. After a few days with decline of anaphylaxis, a general adenitis of the cervical, axillary and inguinal glands was noticed, and the spleen and liver enlarged rapidly. The spleen, after two weeks, reached the umbilicus. Anemia became profound. Fever of a moderate grade ensued, with great prostration, and death from hemiplegia occurred at the end of four weeks. The blood examination, one week before death, showed 35 per cent. of hemoglobin, and 40,000 leukocytes, consisting of 77 per cent. of large lymphocytes, 18 per cent. of small lymphocytes, 3 per cent. of polymorphonuclears, and 2 per cent. of eosinophiles. Among the red cells there were numerous megaloblasts and poikilocytes.

Gali<sup>3</sup> reports a case of lymphatic leukemia in a patient who had suffered for fifteen years with paroxysmal hemoglobinuria. After citing

<sup>1</sup> Boston Medical and Surgical Journal, January 22, 1914.

<sup>2</sup> Journal of the American Medical Association, May 9, 1914, p. 1473.

<sup>3</sup> Zeitsch. f. klin. Med., 1914, lxxx, Nos. 3 and 4.

the case and discussing it, he considers the possible causal relations between the two diseases. The old assumption was that paroxysmal hemoglobinuria was due to lues. But since the researches of Meyers and Emerichs, other infections may be looked upon as the cause. The primary infection leads to disease of the blood-forming organs, either in the sense that diseased erythrocytes are thrown into the circulation, or that, in consequence of the hyperfunction of the spleen, more red blood cells are destroyed and enter the circulation. The organism is infected with diseased erythrocytes, and hemoglobinuria is the result. The views on the origin of leukemia are various. Most authors assume that the acute leukemias arise from infectious diseases. Strongly virulent infections lead more rapidly to secondary phenomena than do less virulent ones. If one accepts the theory of Pappenheim regarding the genesis of leukemia, in this case it may be assumed that the older disease gave rise to the formation of toxins—hemolysins. These toxins in turn gave rise to metaplasia and hyperplasia of the lymphoid tissues and the access of these elements to the blood. Lymphoid leukemia, with paroxysmal hemoglobinuria, has never been described. There have been cases, however, in which, in pernicious and hemolytic anemias, leukemia has appeared. In this case the original infection could not have been lues for the Wassermann reaction was negative. There was a history, however, of joint tuberculosis, and in the right eye there was a distinct keratitis scrophulotica. The author wonders if the tuberculosis gave rise to the paroxysmal hemoglobinuria and in turn to the leukemia.

**PATHOLOGY.** Moreschi<sup>1</sup> has carried out experiments with the idea of studying the formation of typhoid agglutinins in leukemia. He was led to take up this work through the observation that no agglutination took place in the blood of a typhoid patient affected with chronic leukemia. He injected typhoid vaccine in eight cases of leukemia, two of the lymphatic type and six of the myelogenous. In six of these patients there was absolutely no response; while in two whom he had been treating with the Röntgen ray with improvement, there was very slight response. In healthy persons and in those suffering from other diseases, the injection of the same quantity of vaccine produced considerable quantities of agglutinins. He also noted that in the cases of leukemia a rise of temperature did not follow the injection of the vaccine, while in the other cases it did.

Rotky<sup>2</sup> has carried out experiments with eight cases of tuberculosis and multiple sclerosis and two cases of leukemia, testing them for the agglutinating properties of the blood. His findings were in exact accord with Moreschi's, to the effect that in leukemia the blood possesses no agglutinating power. Rotky believes that this indicates an incapacity

<sup>1</sup> Ztschr. f. Immunitätsforschung, 1914, xxi.

<sup>2</sup> Zentralbl. f. innere. Med., October 24, 1914.



for the production of antibodies, and suggests that this may explain the lack of resisting power of leukemics to otherwise harmless infections.

Goodall<sup>1</sup> has studied the nitrogenous metabolism in a case of chronic myelogenous leukemia. The patient was a Jewish woman, 32 years, of age, in whom the disease had existed for three and a half years previous to the period of study. For two months prior to and including the period of observation, she was given Coley toxins nearly every day.

On June 7 she was placed on "the starch and cream" diet employed by Folin in studying the urine of normal individuals. This diet was selected because it is practically free from protein and fulfils the caloric requirements. At the same time it permits of comparison with normal protein metabolism. The case is of special interest, inasmuch as the patient was passing through a period of rapid leukocyte dissolution during the time she was under observation. Beginning with June 7, daily estimations were made for one week. In comparing the average daily excretions with the normal, it is seen that there is a considerable increase in the output of total urinary nitrogen and of uric acid. Two points of special interest were noted: (1) That the daily excretion of uric acid nitrogen showed a wide range of variation, 0.11 gm. to 0.33 gm., without any constant relation to the total nitrogen, and (2) that the day when the largest quantity of uric acid was excreted (June 9) the minimum quantity of total nitrogen was excreted. This suggested the possibility of some error, especially so in such cases, as the urinary nitrogen does not normally sink to this low level with this diet as early as the third day, but constant results were obtained with repeated determinations. It is interesting to note, in connection with the increased nitrogen metabolism, that the daily quantity of urine excreted was approximately a little in excess of the quantity excreted by normal persons on this diet, and that on the particular day in which the disturbed relation between the uric acid nitrogen and the total nitrogen was the greatest, an excessive quantity of urine was passed. An inference from these observations relative to the metabolism during rapid leukocyte destruction would favor the hypothesis that the destruction can be carried beyond the uric acid stage. Such a supposition would explain the marked variations which are shown in this case. Retention, for the purpose of new leukocyte formation, while possible, would seem improbable in view of the fact that the white count continued to fall and that no increase was noted within four weeks after the period of observation.

An interesting case of acute myelogenous leukemia is cited by Stone and Fay<sup>2</sup> in which the clinical history began with nosebleed, fever, and

<sup>1</sup> Boston Medical and Surgical Journal, May 21, 1914.

<sup>2</sup> Medical Record, November 28, 1914.

malaise, naturally suggesting the possibility of typhoid. The Widal test proved negative. A complete blood examination revealed 2,480,000 red cells; 40 per cent. hemoglobin; 64,000 leukocytes; a differential count of 200 cells gave 20 per cent. polynuclear neutrophils; 8 per cent. transitionals; 7 per cent. lymphocytes; 23 per cent. large mononuclears; 42 per cent. myelocytes. During the count an occasional nucleated red cell was seen, and there was a moderate degree of poikilocytosis. Blood cultures were made, and a Gram-positive non-pigment-forming staphylococcus was isolated in pure culture. Another blood examination gave identical findings, except that the leukocytes had increased to 70,000. The patient gradually weakened, and finally succumbed. A partial autopsy was allowed and performed, but nothing of importance was noted. It is to be regretted that the marrow of the long bones could not be examined. The authors conclude that they were dealing with a case of myelogenous leukemia ushered in by nose-bleed, running a course at least highly suggestive of an acute infection and terminating in death about thirty-nine days after the onset. In regard to the blood cultures, they believed that contamination with the common staphylococcus albus may be ruled out, because of a most careful technique, because of the occurrence of the same organism in four separate inoculations, and because the colonies of this organism are colorless, not white. They are dealing with either an intercurrent infection, a terminal infection or an infection which is of etiological importance. They believe that a discussion of this question at this time would be of little, or no value, and wish merely to state that the disease had all the ear-marks of an acute infection. According to the authors, a careful blood examination in cases of apparent typhoid fever which fail to give a positive Widal will bring to light more of these interesting and peculiar cases, and that blood culture taken early in the course of the disease will clearly show its bacterial origin and reveal the presence of an organism of low grade virulence, possibly identical with the one mentioned, that has gained entrance to the bone marrow or other hematopoietic tissue and there developed a type of sepsis which manifests itself in the symptom-complex known as myelogenous leukemia.

*A case of acute leukemia simulating caries of the spine* is reported by Rolleston and Frankau.<sup>1</sup> The patient, a boy, aged five years, was admitted to the hospital on August 26, 1913, with the following history: Early in the year, April, he had an attack of whooping-cough followed by measles. From these he recovered somewhat slowly, but, when sent away to the country in July, he appeared to be perfectly well. While away, he fell from a wagon, injuring his back, and as a result of pain was unable to walk for a few days. On his return to London,

however, on August 17, the pain had gone and he was able to walk normally. On August 20 he complained of further severe pain in the back and also on the side of the abdomen. This latter pain disappeared in two days. The pain in the back increased in severity and again prevented him from walking. There had not been any previous illness and the family history was good. A diagnosis of acute tubercular caries of the spine was made, and a complete plaster jacket was applied. X-ray photographs revealed no abnormality. A few days after the application of the jacket the pains in the back disappeared. The temperature, however, remained irregular. About four weeks after admission, increasing pallor was noted, and on October 1, enlargement of the liver was detected which steadily progressed. There was no enlargement of the spleen. On October 24, a severe attack of epistaxis followed by vomiting of recent and altered blood, occurred and lasted for thirty-six hours. On October 28, a Wassermann reaction proved negative. The blood examination on this date showed 830,000 red cells, 14,000 white cells, 17 per cent. polymorphonuclears, 81 per cent. lymphocytes, 2 per cent. eosinophile cells, 20 per cent. hemoglobin, and a color index of 1.18. Considerable variation was noted in the size of the reds, and one normoblast was seen. The proportion of large and small lymphocytes was not given, but, from recollection, the larger forms predominated. The child gradually sank and died on October 31. The necropsy showed that the ribs were thin and the medullary space large and full of deep red marrow; they were so brittle that they broke almost at once on handling. The marrow of the tibia was dull red in color and firm in consistence. The spine was very flexible, and was entirely free from any evidence of tuberculosis. The cancellous tissue of the bodies of the vertebræ was so soft that it could be cut quite easily and the compact bone was thinned out. The marrow was deep red in color. The sacro-iliac joints were free from tuberculosis. Three small hemorrhages were observed in the right retina. The liver weighed 2 pounds, 4 ounces, presented round edges, and was pale, firm, and enlarged. On section, it was pale brown in color, rather translucent in appearance, but did not give the reaction for lardaceous disease. The portal lymphatic glands were not enlarged. The spleen, weighing 2 ounces, was red and engorged. The thymus was well developed but not of abnormal size. The bone marrow from the tibia showed a striking leukoblastic reaction. The cells present in these leukoblastic areas were lymphocyte-like, mostly of large size. The nature of these cells was not clear, but the author regarded them as myeloblasts or pre-myelocytes. The liver was diffusely infiltrated with cells similar to those predominating in the marrow. They filled the capillaries and formed large clusters in the portal spaces. The kidneys were similarly affected. The tonsils showed chronic inflammation, and the crypts were full of inspissated secretion and debris. The main



interest of the case was the simulation of spinal caries by leukemia, for this does not appear to have been observed in any published cases.

Stouch<sup>1</sup> reports a case of acute leukemia which was of interest chiefly because of the gradual and steady decrease in the number of leukocytes until a marked leukopenia was reached. The first count, recorded on September 27, showed 15,150 white cells, of which 9 per cent. were small mononuclear cells, 82 per cent. large, 7 per cent. polymorphonuclears, 1 per cent. eosinophiles, 1 per cent. transitional cells. There was a constant and gradual decrease in the number of white cells until the last count, recorded on October 8, revealed only 1600 leukocytes. On October 6 there were 2800 white cells, with 7 per cent. small mononuclears, 88 per cent. large, 4 per cent. polymorphonuclears. The patient died on October 13. The author observes that the drop in leukocyte count could not have been due to the use of benzol which was administered for only two days and immediately interrupted when the decrease in leukocytes was noted. He believed that this fall in the white count must be considered as spontaneous, which phenomenon is often observed in this disease. There was no reason or clinical indication for the presumption of a septic infection as a complication. A blood culture proved negative. No post-mortem was performed and it was impossible to make a blood count during the last few days of life. A definite answer cannot be given to the question whether a profound anatomical or a functional exhaustion of the organs took place due to the primary (leukemic) infection, revealing itself in spontaneous marked oligocythemia and going hand in hand with a general collapse.

An interesting case is reported by Klieneberger<sup>2</sup> in which the blood picture of acute leukemia showed as a transient symptom. The patient was a serving maid, aged twenty-three years. When she came under observation she was suffering from secondary syphilis. She had a marked idiosyncrasy for mercury, for after 11 inunctions of 4 grams of mercurial ointment and a deep gluteal injection of 0.15 of salicylate of mercury, she developed a very severe necrotic stomatitis with fever, splenomegaly, etc. The first examination of the blood was made after the onset of the mercury intoxication, but in all likelihood, from the history of the case, the blood previously did not vary from the normal. The first blood examination was made on April 1, and revealed 4,900,000 red cells, 60 per cent. hemoglobin, and 4250 leukocytes, of which 39 per cent. were large lymphocytes, 42.5 per cent. small lymphocytes, 0.5 per cent. eosinophiles, 0.5 per cent. basophiles, 8.5 per cent. mononuclears, 9 per cent. transitionals. No neutrophils were present. On April 2 there were 38.75 per cent. of large lymphocytes, 55.5 per cent. small lymphocytes, no polynuclear neutrophils, no eosinophiles, no basophiles, 0.5 per cent. mononuclears, 5.5 per cent. transitionals. On

<sup>1</sup> Medical Record, October 24, 1914.

<sup>2</sup> Münch. med. Woch., May 26, 1914.

April 3 there were 3800 leukocytes, of which 40 per cent. were large lymphocytes, 53 per cent. small lymphocytes, no polynuclear neutrophils, 1 per cent. eosinophiles, no basophiles, 1 per cent. mononuclears, and 5 per cent. transitionals. On April 5 there were 4000 leukocytes, 26 per cent. large lymphocytes, 67 per cent. small lymphocytes, no polynuclear neutrophils, 2 per cent. eosinophiles, no basophiles, no mononuclears, and 5 per cent. transitionals. On April 7 there were 4500 leukocytes, 31 per cent. large lymphocytes, 29 per cent. small lymphocytes, 30 per cent. polynuclear neutrophils, 1 per cent. eosinophiles, no basophiles, no mononuclears, 9 per cent. transitionals.

On April 9 there were 13.5 per cent. large lymphocytes, 20.5 per cent. small lymphocytes, 60.5 per cent. polynuclear neutrophils, 0.5 per cent. eosinophiles, 0.5 per cent. basophiles, 1.5 per cent. mononuclears, and 3 per cent. transitionals. The blood picture varied considerably from day to day after this until April 20, when the count was practically normal. The last count made on April 27 showed 3,488,000 red cells, 41 per cent. of hemoglobin, 2034 leukocytes, 11.5 per cent. of large lymphocytes, 6.5 per cent. small lymphocytes, 73.5 per cent. of polynuclear neutrophils, no eosinophiles, 2.3 per cent. basophiles, 2.5 per cent. transitionals. Here we find in the first week of the septic process (necrotic stomatitis) a lymphatic blood picture with an entire absence of neutrophilic leukocytes. The decrease in the lymphocytes and the appearance in increasing numbers of the neutrophilic leukocytes were coincident with a pneumonia infiltration of the lungs which went on to gangrene. The autopsy excluded lymphemic changes with certainty.

VARIETIES. In discussing secondary, or symptomatic, leukemia, Ward<sup>1</sup> says the division of the anemias into primary and secondary, has long been practiced and accepted, and that a similar division of the leukemias may be conveniently made. What is ordinarily called leukemia the writer would call primary leukemia, and this may be regarded as a disease of which the chief clinical and pathological features reflect the resistance of the blood-forming organs to a stimulus of which the nature is unknown. It is convenient to suppose that this stimulus is produced by the excessive destruction of white cells within the body, just as after a sublethal toxic dose of benzine the red cells are destroyed in the body and their products give rise to a very excessive and irregular reaction of those blood-forming organs which are concerned in the formation of red cells. Nor is this reaction confined to the marrow, glands and spleen; that is, the normal blood-forming organs of the adult. The liver also takes a share, and after death we find, in Glisson's capsule, a by no means inconsiderable amount of tissue which is morphologically (and presumably functionally) identical with that of the marrow or

<sup>1</sup> *Lancet*, May 23, 1914.

glands, as the case may be. In this condition of the liver we see one of the surest criteria of the presence of leukemia. Further search will reveal similar growths in other organs and in organs which are not associated with blood formation even in fetal life. But in all these situations we must assume the presence of proliferative cells which are capable of forming blood cells under the influence of a sufficiently powerful stimulus.

Now in primary leukemia we have the most powerful of all stimuli, *viz.*, an excess of the products of leukocyte destruction—and consequently the resulting changes are better marked than in any other condition. Almost invariably, for example, there is so great a proliferation of white cells that the blood shows two or three hundred times the normal number of white cells. This, however, is not an essential of the disease. We know little or nothing of the mechanism by which the cells of the marrow arrive in the blood stream, but clinical observation sufficiently attests that this is a very variable factor, even in the individual case of leukemia, and that the blood may in some cases or at some time be practically normal. Hence, although a "leukemic blood picture" is good evidence of the changes in the organs detailed above, its absence by no means excludes such changes. It may be stated that in secondary leukemia the further picture of primary leukemia is rarely met with. Just as in the secondary hemolytic anemias, *e. g.*, chronic benzol poisoning—the full, so-called "pernicious," blood picture of Addisonian anemia is not often met with. Histologically the secondary leukemias fall naturally into two classes, *viz.*, secondary lymphemia and secondary myeloid leukemia, these being the usual divisions also of primary leukemia. The former seems to be especially associated with septic diseases, the latter with cancer. Clinically, and here it must be admitted that much more information is necessary before any one can venture to speak with assurance, it seems that we can recognize certain classes of cases, more often associated with secondary leukemia than others. Of course, in all these cases the leukemia is purely a symptom. It is secondary to obvious or plausibly conjectured causes.

After quoting the reports of numerous cases and pathological findings, Ward concludes that a consideration of these cases alone is sufficient justification for a division of leukemia into primary and secondary. It is quite true that primary leukemia, of which the cause is not established, may be due to some microorganism which will eventually be identified. Then all leukemias will take their proper places as symptoms of the specific infections or other disease processes with which they are associated. The so-called primary anemias are already reaching the stage to which leukemias must eventually come. No progress, however, is likely to be made with the study of leukemia clinically until subdivisions are established and in this case the idiopathic varieties are properly, and according to precedent, labeled primary until their true nature can be established.



Of 59 consecutive cases of leukemia examined by Pantou, Tidy and Pearson<sup>1</sup> 16 have been classed as acute myeloid, 29 as chronic myeloid, 8 as acute lymphoid leukemia, and 6 as chronic lymphoid. They state that it is evident that the clinical picture of leukemia varies with the acuteness or chronicity of the disease, and not with the lymphoid or myeloid origin of the cells. Acute lymphoid and acute myeloid leukemia are clinically indistinguishable, and so may be chronic lymphoid and chronic myeloid leukemia. Acute lymphoid leukemia has little resemblance to chronic lymphoid, nor acute myeloid to chronic myeloid, except insofar as chronic myeloid may terminate by a condition similar to the acute disease. It is impossible to distinguish, by a blood examination, between the acute and chronic types of myeloid leukemia, but not between acute and chronic lymphoid leukemia. The latter diseases are readily distinguished on clinical grounds. Acute myeloid and acute lymphoid leukemia can be distinguished by the type of cell present, but the conditions have been frequently confused and the clinical course is the same. The confusion has been due to a failure in distinguishing between myeloblasts and lymphocytes. The differentiation is rarely, if ever, difficult for those accustomed to the use of Leishman's or other similar stains. In this connection they have found the oxydase reaction to be quite useless. In no case in the author's experience has the myeloid type of cell been replaced by the lymphoid type, or *vice versa*.

*Chloroma.* Hepburn<sup>2</sup> reports a case of chloroma which is of interest as illustrating the relation of this rare condition to myelogenous leukemia. The patient was a male, aged fifty years, a worker in a lime kiln, who entered the Montreal General Hospital on April 24, 1913, with the history of having been in poor health for some time previous to his acute illness, so that at intervals he had to discontinue his work. Four weeks prior to his admission he developed a dull aching pain in the left lower abdominal quadrant which disappeared in eight days. His acute attack consisted of cough with sputum, weakness, loss of weight, sore mouth and throat and vertigo. His habits were regular. He had had twenty children, fifteen of whom died in infancy. He was a large, well developed man, skin of gray icteroid hue with purpuric spots on the arms and legs. The axillary, anterior cervical and inguinal glands were moderately enlarged and palpable. The tongue was soft and flabby, showing tooth marks. The tonsils were hypertrophied, with edema of the uvula; pharynx, pale; the right side of the fauces was injected. The alveolar borders were spongy. The spleen was palpable three fingers breadth behind the costal border. The day following admission a blood count showed 2,400,000 red cells; 54,000 white cells, and 38 per cent. of hemoglobin. The differential count

<sup>1</sup> Quarterly Journal of Medicine, July, 1914, vii, 28.

<sup>2</sup> Canadian Medical Association Journal, July, 1911.

of 503 white cells gave the following percentages: Polymorphonuclears, 21; small lymphocytes, 43.4; large lymphocytes, 32; eosinophiles, 0.2; large mononuclears, 1.2; transitionals, 1.4; myelocytes, 0.8, and normoblasts, 0.6. The blood count showed a marked increase of mononuclear cells or a lymphocytic predominance. On May 2, the patient had an attack simulating hemorrhage with symptoms of air hunger, restlessness, extreme pallor, prostration, small thready pulse, and loss of vision. Death followed in a short time. The autopsy findings, in brief, showed pale, green tissue in the lungs at the junction of sternum and costal cartilage, in the pancreas, lymph nodes, liver and kidneys; a white green nodule on the border of the stomach and hemorrhages into the skin and pelvis of the kidney. The author infers that the indophenol reaction was found to be positive when applied to the cells composing the new growths. The invaded tissue consisted chiefly of mononuclear cells which varied from the size of a small lymphocyte to more than twice that of a polynuclear leukocyte. Their nuclei were round or irregular in shape. Some of the nuclei were vesicular and contained large chromatic masses. Others were smaller and more dense. The cytoplasm varied in amount. In some cells the cytoplasm was filled with neutrophilic, in others with eosinophilic, and in many others with small, slightly basophilic, granules. A fair proportion of the cells, on the other hand, were non-granular. Mitotic figures were fairly numerous, both in the granular and non-granular cells. The bone marrow was infiltrated throughout with the same type of cell, and an occasional megalokaryocyte and erythrocyte were seen. The blood stream showed numerous cells similar to those seen in the tumor tissue. The author concludes that the case is of interest because it is a striking example of the rare condition ordinarily called chloroma; that it seems to demonstrate that chloroma and acute myelogenous leukemia are the same process, *viz.*, a malignant tumor, which in the one case had invaded normal tissue outside the blood stream, forming greenish masses; and, in the other, has confined itself principally to the blood and bone marrow. It also illustrates the fact that a blood picture which by the ordinary methods is supposed to be lymphocytic, may in reality be myelogenous. In this case the so-called lymphocytes are demonstrated in the routine sections and by the oxydase reaction to be undifferentiated cells of the myelocytic series.

Emden<sup>1</sup> has studied a case of chloroma, and discusses its relation to myeloblastic leukemia. The case occurred in a child, aged five years, and showed the blood picture of a myeloblastic leukemia. The anatomical findings revealed a diffuse infiltration of a malignant growth. The primary seat of this tumor could not be located with surety. Exact tests with the granular methods, especially the oxydase reaction, showed

<sup>1</sup> Deut. Archiv. f. klin. Med., 1914, cxv, Nos. 3 and 4.

that the tumor consisted entirely of myeloblasts. The author concludes that chloroma must be a myeloblastic tumor, and holds that the occurrence of a lymphoma could not be proved with certainty.

Dicristina<sup>1</sup> reports a case of chloroma occurring in a girl, aged six years, who died five months after the onset of the disease, which was ushered in by the appearance of a tumor in the right orbit. The blood findings were those of an acute leukemia. Necropsy revealed an involvement of all the blood-producing organs in the pathological process. The mother of the child was tuberculous, and the child responded positively to the Wassermann reaction but not to specific treatment. There was no other suggestion of syphilis in either child or family; hence, reaction was probably of a non-specific character.

Walls and Goldsmith<sup>2</sup> discuss a case of chloroma which they report, and introduce their paper with the statement that the uncertainty which exists in the classification of a group of diseases, of which chloroma represents one, is such as to demand that all these be published with the hope of ultimate clarification of our knowledge. They say the more literature one sees concerning this class of diseases the more is he confused with the various terms used. It is quite well explained that acute lymphatic leukemia originates in the bone marrow. The same is true of even chronic lymphatic leukemia, with few, if any, exceptions. The disease under consideration has the same point of origin. Therefore, when we compare chloroma, which is essentially acute, with other acute leukemias, one is not able at all times to draw hard and fast lines, especially if we ignore the green color, this being, of course, an autopsy finding. However, the tumors about the head, being the common finding in chloroma and of infrequent occurrence in other leukemias, are always indicative of an unusual type of leukemia. Summing up the whole situation, it seems that for an absolute diagnosis of chloroma, we must depend upon the presence of the greenish color of the lesions at autopsy. The source of the color has always been an interesting question. Practically, all authors agree that it disappears a short time after the body is opened. In the case under discussion, however, we have an exception, inasmuch as the color persisted in preserving fluid.

**TREATMENT.** In the treatment of the leukemias we seem to be no further along than we were last year. The status of *Röntgen ray treatment* seems fairly well fixed and receives but little consideration in the literature of the year. The use of *benzol* in the disease has hardly proven to be all that it promised as a therapeutic aid. In the use of this drug, a previous, alternating, or accompanying course of Röntgen treatment appears to be beneficial. A new method of treatment is suggested by Kiralyfi in the *intramuscular injection of defibrinated blood*.

In discussing the means at our command for combatting leukemia,

<sup>1</sup> *Pediatrics*, Naples, October, 1914.

<sup>2</sup> *American Journal of the Medical Sciences*, June, 1914.



Hahn<sup>1</sup> states that while in the last four years we have been given a few more weapons with which to fight it, yet the crucial point, its cause, remains a mystery. Vigorous treatment is usually contra-indicated unless the anemia is increasing, distressing leukemic tumors appear, or the leukocytes increase to an extreme degree. The reason for this contra-indication is the liability to an acute sudden aggravation of the condition when everything seems to be going well under the treatment. The relapse may prove worse than the original attack. The Röntgen rays seem to check the growth of the hyperplastic white corpuscle-producing tissues, but over-dosage may be fatal, and too small doses may actually overstimulate these tissues. In Decastello's case of chronic myelosis, the white cells dropped, after three mild exposures, from 720,000 to 400, with 0.9 per cent. neutrophiles, and hemorrhages ensued from which the patient died. Schwartz has reported disastrous results from stimulation of functioning by very small doses. In this group belong the cases of leukemia developing in professional röntgenologists. Heinecke has lately compiled six cases of this kind. Hahn advocates systematic exposure of every accessible gland in the lymphatic form, but, with myelogenous leukemia, exposure of the enlarged spleen by itself answers the purpose. In cases of resistance and recurrences, the author has achieved good results from exposing the long bones of the legs between the series of other exposures. He noted a great improvement in the symptoms and general health in 75 per cent. of his cases. Bécclère has reported no failure in his 12 lymphatic and 93 myelogenous cases. Radio-active substances fail in about 20 per cent. of the cases, according to the literature to date. The action and the effect seem to be about the same as with the Röntgen rays; the lymphatic form seems to be less susceptible to the Röntgen ray reaction, and recurrence is inevitable.

*Benzol* is recommended by some and denounced by others. It, however, should not be given with disease of the liver or kidneys, or with catarrhal intestinal trouble, and it should be suspended when the leukocytes have dropped to 20,000 or 25,000. Hahn's test shows the advantage of changing from one method of treatment to another; one appears to pave the way for a better utilization of another, while both can be used with lesser dosage, possibly commencing with the Röntgen rays and continuing with benzol, not giving above 1 gm. daily of the latter. If myeloblasts present themselves in great numbers under Röntgen treatment, he changes to thorium X and follows with a vigorous treatment of arsenic. When to begin treatment again with recurrence is still a question. It is his practice to keep up the Röntgen exposures after abatement of symptoms, giving every week or two a fraction of an erythem dose, and recently he has been giving occasionally 0.5 or

<sup>1</sup> *Therapeutische Monatsschrift*, August, 1914.

1 gm. of benzol daily, cautiously supervising the liver and kidney functioning, and resorting to vigorous treatment at the first signs of any flaring up of the process. In acute leukemia all treatment seems to be hopeless, but as it is not always easy to differentiate the acute form, thorium X plus a vigorous course of arsenic should be used.

Warthin<sup>1</sup> has studied the *minute changes produced in leukemic patients by exposure to Röntgen rays*. In no case coming under his observation were the conditions in the hematopoietic organs changed to normal. The effect of the treatment is essentially degenerative and inhibitive, but the essential leukemic process goes on unchecked, although greatly modified. The treatment is, therefore, not curative. In the first stages of the treatment, the leukemic tissues show great degeneration and destruction of the white-cell-forming tissues. It may completely disappear from the spleen, and the processes of white-cell-formation may be so inhibited that an aleukemic condition of the blood may result. After some months there arises a more undifferentiated leukoblastic tissue, particularly in the retroperitoneal hemolymph nodes and in the bone-marrow; the leukemic condition of the blood may return or it may not. With an increasing cachexia the process may be terminated by symptoms of intoxication, or by some secondary event, as hemorrhage from the necrotic spleen.

The changes in the kidney, which may be very marked (cloudy swelling, simple necrosis, and calcification), may also in part be responsible for the fatal termination. Prolonged irradiation of the hematopoietic organs in leukemia causes first a degeneration of the young and maternal cells, leading to a great decrease in the output of leukocytes, particularly in myelemia. To this destructive effect there succeeds a reaction in which cells of a more resistant type are formed, and the essential leukemic process remains unchecked, although altered in character.

Pulawski<sup>2</sup> reports a case of lymphatic leukemia in which he lays stress on *the combination of röntgenotherapy with benzol*. His patient was a woman, aged fifty-one years, who for two years had had enlarged lymph nodes in different parts and an abdominal tumor. Her complaints were of sacral pains and pain in the left abdomen, weakness, and cough. There were signs of mild kidney trouble and the blood findings were of the lymphatic leukemic type. Under six Röntgen exposures in nine days, the whites dropped from 425,600 to a third of that number; this was followed with 50 gm. of benzol in sixteen days and the whites dropped to 8400. During the last week or so of the benzol course there was some fever. Then the Röntgen exposures were begun again, four being given in nineteen days. After cessation of the benzol treatment, the whites continued their decline, finally reaching 1100 and then 2000.

<sup>1</sup> American Journal of the Medical Sciences, January, 1914, cxlvii, No. 1.

Wiener klin. Woch., May 7, 1914, xxvii, 19.

by the end of three months' course of treatment. The general health has improved as well as the blood picture. The lymphocytes fell from 90 to 41 per cent., the neutrophils climbed from 10 to 49 per cent. The lymph nodes have gone back to their normal size and the spleen to a quarter of its first size. The anemia was quite marked when the benzol course was ended, but improved under iron, arsenic, calcium glycerophosphate, and cod liver oil.

Boehm<sup>1</sup>, Phelerin and Lukiantchenko<sup>2</sup> and Sappington and Pearson<sup>3</sup> all report cases with more or less marked improvement through the use of benzol combined with the Röntgen rays.

Smith<sup>4</sup> reports a case of myelogenous leukemia and a case of lymphatic leukemia treated with benzol, the first showing rather marked improvement up to date; the second showing no improvement whatever. In concluding his discussion of the cases he says that after all we have no proof yet that benzol is specific. So long as myelocytes exist, leukemia must still be active. It is significant that not one clinician has yet expressed himself with reference to the future of these patients. Are we to believe, as the optimistic reports would tacitly allow us to, that in benzol we have a specific? Or are we to believe that treatment will have to be continued periodically and indefinitely, like thyroid therapy? Or will the time come in many cases when in spite of, if not because of, benzol treatment, the leukemia will return in fulminant form, and the patient rapidly succumb to an acute exacerbation? Time alone will reveal.

He hazards the guess that within the next six months the journals will contain numerous reports of recrudescences of the disease after benzol suspension. It is a remarkable remedy, spectacular in its effects, deserving of the utmost respect as well as caution in its administration, yet, he fears, not a specific.

Sappington and Pearson<sup>5</sup> summarize the results of their treatment of three cases of leukemia as follows:

1. In a case of chronic myeloid leukemia under benzol, treated previously and concurrently with Röntgen rays, the leukocyte count remains relatively low though the formula is changed in favor of large mononuclears. The spleen remains the same size, but the patient generally is improved. The patient has been under observation two years.

2. In a case of chronic lymphatic leukemia, benzol, without Röntgen assistance, restored the white count to normal. Later, Röntgen rays were used for a short period. The patient has now been without benzol or Röntgen rays for six months, yet the leukocyte count remains low

<sup>1</sup> Med. Klinik, May 17, 1914.

<sup>2</sup> Meditsinske Obazrenie, Moscow, 1914, lxxx, 20.

<sup>3</sup> Journal of American Medical Association, July 11, 1914.

<sup>4</sup> Ibid., March 24, 1914.

<sup>5</sup> Ibid., July 11, 1914.



and almost within normal limits. The formula, however, has returned to a high percentage of lymphocytes. The spleen did not diminish in size and is now further enlarged. The patient has been under observation one year.

3. In a case of acute leukemia, benzol seemed to have had no effect one way or the other on the blood or the size of the spleen. The necropsy findings were typical of acute leukemia; there were no liver necroses or damaging effects of benzol apparent. Metabolism studies did not reveal any marked losses.

Moller<sup>1</sup> has treated three cases with benzol, the dosage being 1 gm. on the first day, and increasing the dose 1 gm. a day to a total of 4 gm. The daily dosage was then kept at 3 or 3.5 gm. for four months. One of the patients suffered from pseudoleukemia and in this case the blood underwent a destructive process which proved fatal about a month after medication was suspended. There was marked dyspnea and hemorrhages from the gums. The erythrocytes dropped to 900,000, and the leukocytes to 625. At first the improvement under the use of benzol was striking. The second patient had myeloid leukemia and in this case a clinical cure seems to have resulted up to date, which is eight months since treatment was discontinued. A third case, a patient with lymphatic leukemia also appeared to be clinically cured, but has since died from an intercurrent pneumonia.

Mitchell<sup>2</sup> reports a case of lymphatic leukemia which showed improvement under the use of benzol, the improvement persisting ten months after treatment.

Liberow<sup>3</sup> and Koppang<sup>4</sup> each report a case of myeloid leukemia showing improvement through treatment with benzol.

Spiegler<sup>5</sup> reports a case of myeloid leukemia in a woman, aged thirty-eight years. Two months after the use of benzol she was much improved, but came back five months later with extreme anemia, only 1400 leukocytes, and numerous hemorrhages into the skin and mucous membranes. At one count the leukocytes numbered only 400. Necropsy showed signs of severe toxic injury of the parenchyma of different organs, most marked in the liver and kidneys. There was no apparent change in the spleen, but the granular elements could not be seen in the blood, and lymphocytes took their place. Two similar cases have been published in which the leukocytes dropped under benzol from 988,000 to 1720 and from 56,000 to 5300, and afterward to 200. These experiences show us the necessity for vigilant and repeated control of the blood count as absolutely necessary whenever benzol is being used.

<sup>1</sup> Hospitalstidende, Copenhagen, July 1, 1914.

<sup>2</sup> Ohio State Medical Journal, November, 1914.

<sup>3</sup> Therapeutische Monatshefte, May, 1914.

<sup>4</sup> Norsk. Mag. f. Lægevidenskaben, May, 1914.

Wien. klin. Woch., April 16, 1914.

Cornwall<sup>1</sup> reports a case of acute lymphocythemia treated by benzol in very small doses, 5 minims of the drug three times a day. From November 8 until November 19, there was a steady rise in the leukocytes from 20,000 on the former date to 351,000 on the latter date, with a high percentage, 90 or more, of lymphocytes throughout. The patient's condition steadily grew worse during the stay in the hospital and death, from asthenia, occurred on November 20.

Kiralyfi<sup>2</sup> recommends *intramuscular injections of defibrinated blood* in the treatment of leukemia. He has noted a stimulating effect on the bone-marrow in those cases where there has been an excess of benzol or Röntgen treatment, where the apparent benefit resulting from the use of these treatments has given place to an acute exacerbation. In a case reported in detail, a merchant, aged fifty-nine years, with myeloid leukemia for about six months showed improvement after six days of benzol treatment. The whites fell from 31,000 to 13,000, and the benzol was discontinued. The whites continued to fall until they numbered only 2150, and the reds dropped to 1,000,000, and the patient suffered intense pains in his limbs. A venesection had just been done to help a patient with polycythemia, and 10 c.c. of the blood taken from this patient was injected into the gluteal muscle of the leukemic patient. By the next day the whites had climbed to 7000 and by the fourth day to 11,900 and the reds numbered 150,000 more, showing that the exhausted bone-marrow had commenced to show signs of improvement. The injection was repeated with ordinary blood nine days and again three weeks later, and the improvement kept on. The complexion became natural, the swollen glands subsided, and the once bed-ridden patient was able to be up and about. The reds have kept since at about 2,000,000 and the whites from 9000 to 10,000.

**Hodgkin's Disease.** The interest displayed by the literature of the past year in this disease is confined almost entirely to its pathogenesis. Last year Bunting and Yates<sup>3</sup> published a preliminary note in which they announced the discovery of a probable etiologic factor in Hodgkin's disease in the form of a diphtheroid organism. Since making that report the course of their experimental work<sup>4</sup> has convinced them that the culture they were using, is pathogenic and has further shown that the virulence of the organism to the monkey may easily be increased, even to the point of producing death of the animal after a relatively acute illness. While the histologic picture of the enlarged lymph nodes of the monkey, taken three months after the successful inoculation, left no question as to relation of the lesion to that of human Hodgkin's disease of the same duration, the great difficulty seemed to be to secure infection

<sup>1</sup> New York Medical Journal, March 21, 1914.

<sup>2</sup> Wien. klin. Woch., July 30, 1914.

<sup>3</sup> See PROGRESSIVE MEDICINE, June, 1914.

<sup>4</sup> Journal of American Medical Association, February 14, 1914.

and at the same time to avoid so great virulence as to produce extensive necrosis and softening and even suppuration. The working space between these two limits seems very narrow.

Extensive necrosis and leukocytic infiltration of the glands may seem foreign to the usual chronic picture of the lymph nodes in Hodgkin's disease, yet a recent clinical case has demonstrated that even in man the virulence of the organism may be such as to lead to these features. With an apparent duration of six months, there was in this case marked involvement of cervical, axillary and mediastinal glands, febrile reaction and leukocytosis (44,000). While the excised glands showed all the elements of well-developed Hodgkin's disease, there were, in addition, extensive areas of necrosis, softening, and leukocytic infiltration. Yet culturally, the diphtheroid organism, which was obtained from both cervical and axillary glands, was the only organism to grow.

At present, their results indicate that the survival of an animal for the requisite length of time is all that is needed for a demonstration of the chronic lymph node picture seen in the well-developed cases of Hodgkin's disease.

They conclude, since their experiments demonstrate that the diphtheroid organism is pathogenic for the monkey, that it produces a progressive enlargement of the lymph nodes, with lesions similar to those of Hodgkin's disease in man, and, further, that the blood-changes in the monkey are similar to those in man, they feel fully assured of the etiologic relationship of the diphtheroid organism (*Bacterium hodgkini*) to Hodgkin's disease.

Schaffer,<sup>1</sup> through the injection of a lympho-granulomatous gland in which neither acid-fast nor Much granulated rods were found, produced in a guinea-pig granulation tissue containing giant cells of the Sternberg-Paltauf type which appeared at the point of injection as a tumor about the size of a hen's egg. Granulomatous spots were found in the lymph glands, the liver, spleen, and lungs. In the latter, intracellular, acid-fast rods were found in the granulomatous spots.

Bunting<sup>2</sup> states that Hodgkin's disease is infectious, and due to a diphtheroid organism *Bacterium hodgkini*. There may often be found a primary lesion at the portal of entry. While in some cases the organisms may remain for a long time localized in the vicinity of the portal of entry, in other cases they early gain entrance into the general circulation and may be widely distributed. The organism and its toxin show a special affinity for lymphoid tissue, and produce in this the characteristic changes of Hodgkin's disease, changes varying somewhat according to the intensity of the toxin but resulting ultimately in the sclerosis of the glands. There is at the same time an interglandular inflammatory process, at times very acute, but resulting finally in a

<sup>1</sup> Berl. klin. Woch., June 29, 1914.

<sup>2</sup> Bulletin of Johns Hopkins Hospital, June, 1914.



dense sclerotic tissue. There are also characteristic blood changes in the disease. The glandular changes can then be considered only as the result of a toxic action, and contribute to the patient's death merely incidentally, when certain gland groups are extensively enlarged. The cells of the enlarged glands, though atypical, show none of the antagonism to the other body cells characteristic of malignant neoplasms.

Yates<sup>1</sup> regards Hodgkin's disease as a localized process susceptible of cure when properly treated as a malign, though chronic infection. It may persist for years without manifesting itself save in the blood-picture, so that cures may not be assumed until after an uninterrupted duration of years of persistently normal conditions. A sovereign remedy for all cases is not now conceivable. At present the greatest need is some therapeutic agency to control glands not directly accessible; for, once extension, which may occur early, has reached either the thorax or abdomen, the prognosis becomes relatively, if not absolutely, hopeless.

Bunting<sup>2</sup> has studied a series of cases of Hodgkin's disease, including 15 males and 10 females a higher percentage than is usually given for the latter sex. It is rather striking that the great majority of the males are under the thirty-third year, while the majority of the females are above that age. The study of the blood in these cases has shown that there is a deviation from the normal leukocytic picture in all cases, but that there is not a single constant picture found in them. Instead, it is possible to divide the cases into two distinct groups, according to the differential count of the leukocytes. The first group, including cases of a year or less in duration, shows a normal or slightly increased total leukocyte count, with a normal or decreased percentage of polymorphonuclear neutrophils.

The second group includes the cases of greater duration, for the most part, and shows a sharp leukocytosis, running in one case (as far as could be determined from the smear ratio of one white cell to twenty-nine red cells) to at least 100,000 leukocytes per cubic millimeter. This leukocytosis is accompanied by an increase of the neutrophils to a percentage between 72 and 90—a percentage not ordinarily considered of value in diagnosing a suppurative process in the body, yet occurring in Hodgkin's disease in the complete absence of pus formation. Throughout the disease there are two constant features, an increase in blood platelets and an absolute increase in the transitional leukocytes. In regard to the other elements, in early cases there is a transitory increase in lymphocytes and basophiles, and a deficiency in eosinophiles, with a normal or low neutrophile count, followed by a gradual decrease in lymphocytes and a moderate eosinophilia. In late cases there is a marked neutrophile leukocytosis and a diminution

<sup>1</sup> Bulletin of Johns Hopkins Hospital, June, 1914.

<sup>2</sup> Ibid.

in percentage in all other elements except the transitional leukocyte. All of these features of the blood picture in Hodgkin's disease have been reproduced in the monkey following inoculation with the diphtheroid organism isolated from cases of the disease.

Kusunoki<sup>1</sup> has made a study of 16 cases of lymphomatosis granulomatosa. The patients ranged from four to sixty-four years of age, and 8 of the 16 were twenty to thirty years of age. The localization of the disease most frequently occurred in the lymph glands of the upper body region. In the histologic pictures one saw fibroblasts, lymphocytes, large cells rich in protoplasm and giant cells. The amount and relation of these different cell forms to each other, and likewise the amount of the connective tissue, vary greatly in the different cases. In the majority of cases, plasma cells and the eosinophile cells could be demonstrated, and the latter many times appear in great numbers. Both of these cell formations were specially abundant in the capsular portions of the nodes. Of those cases where large numbers of eosinophile cells occurred, one also found regularly numerous polymorphonuclear leukocytes. Spots of necrosis occurred frequently and were usually of small size. No especial relationship between the eosinophile cells and the necrosis appears to exist. In all 16 cases in sections as well as in antiformin sediment, in the typical lympho-granulomatous material, Gram-positive granulated rods, which were not acid-fast, were demonstrated. In one case, in addition to the granulomatous lymph gland containing only Gram-positive granulated rods, a typical tuberculous lymph gland was found containing exclusively acid-fast bacilli. The number of Gram-positive granulated rods varied in the different cases. In those cases in which the development of the connective tissue was especially marked, the rods were found in smaller numbers than in those cases where the connective tissue was less well developed. On the other hand, the rods occurred more frequently in those cases in which the growth of extremely large cells was prominent, and giant cells were present in larger numbers than in the other cases. Neither between the eosinophile cells, the plasma cells nor the necrosis on the one hand, and, on the other hand, the number of rods found could any relationship be established. The author believes that these findings support the suspicion of an etiologic importance of these Gram-positive granulated rods in lympho-granulomatosis. Whether these rods stand in any relationship to the tubercle bacillus must remain an open question, yet it appears probable to the author that these rods are not identical with the true tubercle bacillus.

**Polycythemia.** The literature of the year on polycythemia has been exceedingly scant, and little or nothing has been added to our knowledge of this condition. Hertz and Erlich<sup>2</sup> have investigated *the effects*

<sup>1</sup> Virchow's Archiv f. path. Anat., 1914, cexv.

<sup>2</sup> Deut. Archiv f. klin. Med., 1914, cxvi, 1 and 2.

of small doses of toluylendiamine on the blood and the production of experimental polycythemia. They used full grown guinea-pigs of about 3 kg. weight, and their doses of the drug varied from 0.01 to 0.02 gm. pro kilo of body weight given at varying intervals of time. These studies showed that small doses of toluylendiamine caused a destruction of erythrocytes. Under their influence, now and then an increase in the resistance of the red blood corpuscles was observed. The administration of small doses lead to the formation of hematopoetine. With the aid of small doses, a polycythemia could be produced. The authors hold that in an experimental way they have thus demonstrated a causal relationship between polycythemia and anemia.

Hedenius<sup>1</sup> reports 19 cases of chronic polycythemia, 9 of which were accompanied by pronounced pathological conditions, while 10 of them seemed to be practically physiologic. He is led to believe, from a study of these cases, that the high blood-pressure is a complication and not a consequence of the polycythemia. Three of the cases showed a reduction in the size of the spleen and in the number of red cells during menstruation. In the pathologic group, 5 of the cases had counts of over 9,000,000 cells. They all had different combinations of the typical symptoms, cyanosis, enlargement of the spleen and high blood-pressure with the unusual numbers of erythrocytes. There was also a tendency to headache, slight dizziness, partial incapacity for work and restless sleep or somnolency, suggesting a cerebral neurasthenic state. While the hemoglobin percentage was relatively low and the hemoglobin index low, the blood-producing organs showed signs of exaggerated function. Of the leukocytes, the proportion of mononuclears was abnormally high. The author believes that the low color index explains why polycythemia so often escapes early recognition. From the course and nature of the disease it would seem to be a constitutional affection like gout, obesity and diabetes, and in this series it is noteworthy that there was a pronounced gouty tendency in 8 cases. The author suggests the possibility that epinephrin may hold some relation to the exaggerated functioning of the bone-marrow.

Mosse<sup>2</sup> has reported a case of this affection which is similar to some others recorded in which the polycythemia was accompanied by urobilin, jaundice, and enlarged spleen. At necropsy, the spleen was found gorged with blood. There was evidently hyperplasia of the red bone-marrow, and the liver showed signs of cirrhosis. The author thinks that the liver condition must be regarded as secondary.

Douglas and Eisenbrey<sup>3</sup> have reported in great detail a case of tuberculosis of the spleen with septic infarction and polycythemia in which splenectomy was performed. The patient died on the ninth day after

<sup>1</sup> *Sevenska Läkaresällskapets Handlingar*, 1914, xl, No. 3.

<sup>2</sup> *Zeit. f. klin. Med.*, 1914, lxxix, 5 and 6.

<sup>3</sup> *American Journal of the Medical Sciences*, April, 1914.



the operation, and an autopsy was performed. The authors say that obviously there is little possibility of any inferences being drawn as to the result of operation in cases of tuberculosis of the spleen or of polycythemia, from their experience in this case. Of course, the autopsy findings, demonstrating the obliterative arteritis of the celiac axis and superior mesenteric vessels resulting in gangrene of the intestines and causing death, showed plainly the futility of any therapeutic measures in this particular case. And if this arteritis had not caused an early fatal termination, the lesion in the apex of the heart with its thrombus, shown to contain tubercle bacilli by guinea-pig injection, might reasonably be expected to result fatally within a short time.

It is of interest to note that in the present case, during the nine days after splenectomy, the red cell count remained high, between 8,000,000, immediately after operation, and 7,400,000 on the day of his death, while the hemoglobin remained at over 120 per cent. This result one would expect if it is true that "the spleen is the graveyard of the red blood corpuscle" in the adult, although Pearce and Austin, in a study of splenectomized animals, found results indicating the power of the lymph glands and liver cells to compensate, after the loss of the spleen, by taking up its function of destroying red corpuscles. However, Musser found "that there was, after experimental splenectomy, a secondary anemia which lasted about two and one-half months." He also found a postoperative leukocytosis most marked twenty-four hours after operation, and lasting a variable time. His counts were continued 138 days in some cases, and the leukocytosis was still present. There was a marked increase in the polynuclear cells, and a diminished lymphocyte count. In the present case this postoperative leukocytosis was a marked feature, reaching 87,000, with 98 per cent. of polynuclear cells on the second day after operation, and then gradually falling, but not back to normal.

It has previously been suggested that the tuberculosis of the spleen, in view of the autopsy findings, might be the simplest explanation for the polycythemia on the basis that the diseased spleen failed to destroy the red corpuscles. Other case reports of polycythemia, however, show numerous examples of the disease in which the spleen, while enlarged, was not tuberculous, and in 26 of the cases of tuberculosis of the spleen where the blood count was reported, collected by Winternitz, polycythemia was present only in 6. Also, the condition of the bone-marrow in this and in other cases, and the blood-picture after splenectomy, would seem to indicate as a more logical presumption, that, whatever may be its cause, the polycythemia, and in this case it was a polycythemia and not an erythrocythemia alone, had its direct pathological factor in the overproduction or overfunctionating of the bone-marrow. If this presumption is correct, then we can explain the enlargement of the spleen as an hypertrophy due to an effort to destroy

the overproduction of red cells. Finally, if there is a focus of tuberculosis elsewhere in the body from which the tubercle bacilli might enter the blood-stream, it would find in the spleen a place of diminished resistance. Thus, rather than as an etiological factor, the tuberculous spleen would be a result of the polycythemia.

Finally, while we may agree with Winternitz that in cases of tuberculosis of the spleen, when other tuberculous foci are not demonstrable, splenectomy may effect a cure; although this case proves nothing, it does add some evidence to the statement of Osler that splenectomy is contra-indicated in erythrocythemia, and that when the two conditions coexist operative procedure can be of no value.

TREATMENT. McLester<sup>1</sup> reports the case of a patient suffering from severe polycythemia who showed complete amelioration of all symptoms following the administration of *benzol*. Up to the time of the report, which was three months after the last administration of the drug, the improvement continued to hold good.

The author first saw the patient in March, 1913, two years after the onset of symptoms.

The red blood cells were 8,300,000 and the leukocytes 26,000. The differential count, made with Wright's stain, was: Polymorphonuclear neutrophils, 94 per cent.; polymorphonuclear eosinophils, 2 per cent.; no polymorphonuclear basophils; small mononuclears, 2.5 per cent.; large mononuclears, 1.5 per cent.; no myelocytes.

Nothing widely at variance from the normal could be seen in the character of the red cells. Slight variations in size and in tinctorial character were seen. Occasionally mild polychromatophilia and very rarely a nucleated cell appeared. One megaloblast was found. Beyond great increase in the numbers of the white cells, at the expense of the polymorphonuclears, these cells presented nothing unusual.

The hemoglobin, estimated by means of 10 c.c. volumetric flasks and the Augentrieth-Königsberger colorimeter, was 18.5 per cent.

During the following three months, with no treatment beyond diet and hygienic measures, the red cells increased to 12,700,000, and the leukocytes to 29,000 (June 10, 1913). Slight downward fluctuation followed, and on July 21, with the red blood cells 10,500,000, *benzol* was begun.

Ascending doses, beginning with 1 gm. three times daily, and finally reaching 4 gm. three times daily, of an emulsion containing 25 per cent. *benzol*, 25 per cent. olive oil, and 50 per cent. mucilage of acacia, were given. Thus the maximum dose of *benzol* was 4 gm. per day. A gradual fall in the number of red cells, as well as in the number of leukocytes, was noted. After five months (December 13, 1913) the red cells numbered 6,600,000, the whites 10,000. Within the next

<sup>1</sup> Journal American Medical Association, May 2, 1914.

four weeks the red cells dropped to 5,000,000. Thinking this perhaps an error, the patient was requested to return for another count. On his return three days later the red cells were 4,300,000. The benzol was immediately discontinued. Within the next four weeks the red cells rose to 6,000,000. In the four weeks following they fell to 5,000,000, and for the next seven weeks (February 17 to April 8) the red cells have remained stationary. The last differential count was: Polymorphonuclear neutrophiles, 85 per cent.; polymorphonuclear eosinophiles, 2.6 per cent.; polymorphonuclear basophiles, 0.8 per cent.; small mononuclears, 7 per cent.; large mononuclears, 4.6 per cent.; no myelocytes.

The changes in the urine were noteworthy. The casts and red blood cells gradually disappeared, and, though a trace of albumin is now present, it also at one time disappeared. Evidently Moewes' suspicions as to the irritative effect of benzol on the kidney are not confirmed by this case.

During the period of improvement in the blood picture the patient has shown equal improvement from every other aspect. His appearance is now that of a normal man. The itching, the disturbance of vision and the headaches have completely disappeared. The pain in the left hypochondrium and the pain under the left scapula, of which he frequently complained, no longer disturb him. The spleen cannot be palpated. The suggestive rales formerly heard at the apex of the left lung can no longer be detected. The patient's general sense of well-being is marked. He states that he feels better than he has felt in years.

**Pernicious Anemia.** ETIOLOGY. William Hunter,<sup>1</sup> in an address, discusses the relationship of oral sepsis to septic anemia. This subject treated by the same author was fully reviewed in these pages in 1911. In an article reviewing the work on the relation of severe anemia to gastro-intestinal disturbances, Schmidt<sup>2</sup> concludes that if the experiences hitherto spoken of seem to confirm the causal connection between certain digestive disturbances and the development of pernicious anemia, it is not at all probable that all cases of this disease have this origin. Only one-third of the patients suffering from pernicious anemia show marked intestinal troubles, and the number of dyspeptic persons who acquire severe anemia is not higher. Moreover, experience shows that the anemic condition when once developed does not always go parallel with the intestinal troubles; while the latter may be a relapse, the anemia often maintains its progressive character even when the digestion has improved under careful treatment. Schaumann studied the fate of his patients who recovered from bothrioccephalus anemia and found that part of them still inclined to relapsing anemia. This observation and other circumstances induced him to believe that a constitutional state

<sup>1</sup> Practitioner, February, 1914.

<sup>2</sup> American Journal of the Medical Sciences, September, 1914.



forms the basis upon which different lesions may give rise to pernicious anemia. Indeed Bartlett, Pateck, Matthes, and others, saw striking examples of family or hereditary development of the disease. Pernicious anemia can be produced also by causes which have no connection with the gastro-intestinal tube, such as lues, pregnancy, septic infection, chronic nephritis, etc., though the intestine as the chief place of absorption prevails. If the experiment recently made by Eppinger and Delecastello, that the extirpation of the spleen is able to cure certain cases of pernicious anemia, should be confirmed in the future, we must deal with the possibility of an accumulation of the hemolytic agent in the spleen, as Banti supposes to take place in the disease called after him.

The blood changes of pernicious anemia, interpreted by the hematologist as a degeneration of blood formation leads to the same suggestion of a various etiology for the disease. There is no proof that only toxic irritation of the bone-marrow produces the megaloblastic type of blood formation. Every sort of exhaustion can do the same. Often the first attack can be combated by stimulating the blood-forming organs with arsenic. If the cause of permanent blood dissolution is at once removed, the anemia may disappear.

In a discussion of the PATHOGENESIS of pernicious anemia, Cedarberg<sup>1</sup> presents evidence to the effect that pernicious anemia results from a sort of anaphylaxis which is brought about by entrance into the blood of products resulting from the breaking down of protein in the intestine. These substances gain access to the blood by seepage through a constitutionally inferior intestinal wall. This is known to be the cause of anemia when certain helminths render the intestinal wall permeable, and it is known that the patients recover when the parasites are expelled. In the essential form of anemia the intestinal walls become naturally permeable and the blood suffers from the continuous supply of the products of protein metabolism. He calls attention to the necessity consequently for restricting the intake of alien protein to the lowest possible minimum. The intestines may be able to take care of a small amount of protein and assimilate it completely, leaving none to get in to the parenteral circulation. It may be possible further to supply the necessary protein in a form which is free from the dangers of the ordinary kinds now in use.

Iwao<sup>2</sup> has been able to produce severe anemia of the pernicious type by the daily subcutaneous injection of small doses of oxyphenylethylamin. The amins may be produced by bacterial changes in the protein and their derivatives. Oxyphenylethylamin is produced by the action of the bacillus coli communis on amino acid tyrosin. The salts of this amin do not bring about hemolysis *in vitro*.

Krotkoff<sup>3</sup> has carried out experiments with rabbits with the idea of

<sup>1</sup> Berl. klin. Woch., March 30, 1914.

<sup>2</sup> Biochem. Ztschr., 1914, lix.

<sup>3</sup> Russk. Vrach., January 18, 1914.

establishing the part which vitiated air plays in the etiology of anemia. He found that, providing the animals are healthy, they could bear with impunity a considerably vitiated atmosphere containing 8 or 10 per cent. of carbon dioxide. The blood remained normal, but the animals showed loss of weight. An experimental anemia was induced in rabbits by injecting phenyl hydrazin which reduced the hemoglobin to 15 or 30 per cent. and the red cells to 1,050,000. Three of these rabbits were kept in the open air and three were closed up in boxes for two months. In both series the hemoglobin percentage and the red cell count became normal, the leukocyte count remained unchanged. The author thinks that vitiated air can cause anemia in human beings only when there is some predisposition to disease on the part of the blood-making organs. The bad air of prisons, work shops, etc., causes only a pseudo-anemia, that is, a pallor of the integument, but gives rise to no changes in the blood.

**PATHOLOGY.** The nitrogen metabolism before and after splenectomy was studied by Minot<sup>1</sup> in a case of pernicious anemia which showed no improvement for three months. Splenectomy was then performed and the patient's general condition and blood picture improved. At the time of this improvement, the urine became free of urobilinogen, and a more favorable nitrogen balance was struck. At the same time there was an increase in the percentage of urea nitrogen which had previously been below normal.

The neutrophilic blood-picture in pernicious anemia has been studied by Briggs<sup>2</sup> and on these studies he issues a preliminary report. In the course of some work on the Arneth blood picture in various conditions the multiplicity of lobes in the nuclei of the neutrophiles in a case of pernicious anemia was observed. This particular point has since been studied in 9 consecutive cases seen during the past year, and in the stained smears from 3 other cases. In 10 out of the 12 cases a decided increase above the normal number of lobes in the nuclei of the neutrophiles was found, *i. e.*, a "shift to the right," in the terms of Arneth. Further, it was found that of 8 cases of correspondingly severe anemia, not of the idiopathic pernicious variety, 7 showed either a normal number or a decrease in the number of lobes, a "shift to the left." The author concludes that the purpose of this preliminary report is simply to call attention to the increased number of nuclear particles in the neutrophiles in pernicious anemia, a point doubtless noticed many times before but evidently worthy of further study.

**SYMPTOMS.** Barrett<sup>3</sup> has studied clinically the *mental disorders* of 11 cases of pernicious anemia, and in 9 of these a histologic study of the brain was made. The symptomatology of these cases showed consider-

<sup>1</sup> Bulletin of Johns Hopkins Hospital, November, 1914.

<sup>2</sup> American Journal of the Medical Sciences, September, 1914.

<sup>3</sup> American Journal of Insanity, 1914, lxi, 5.

able variety. Two were cases of epilepsy; 2 were not to be differentiated from dementia precox; 1 was a questionable manic-depressive psychosis, and 6 presented a characteristic picture of an asthenic state in which there developed a mental disorder of a paranoid type. It is to these paranoid conditions that this study is particularly devoted.

Brief accounts of 6 cases are given by Barrett. The first 2 of these showed that slight tendency toward delusional elaboration. In the remaining 4, the paranoid features were well developed. The cases, as a whole, have in common an irritability, and a suspiciousness which forms the ground on which develops the delusions of persecution. The content of the delusions is usually influenced by the somatic-neurologic symptoms and the situation in which the patient is placed as a result of these disturbances. In some instances there were auditory hallucinations to which the patient reacted with strong effect. In several cases there was confabulation, which suggested that seen in Korsakow's symptom-complex. There was no marked deterioration present, the comprehension and orientation were usually clear, except for rare episodes, in which they were slightly disturbed. In two instances the mood was slightly expansive. In a number of instances the course showed remission in the intensity of the symptoms and these corresponded to the remissions in the physical conditions. Underlying the development of the mental condition in all but one of these cases was a hereditary predisposition. In several instances there were a number of occurrences of mental abnormalities or insanity among the ancestors. In all cases of pernicious anemia with mental disorders studied, hereditary factors were found in the greater number.

The histologic changes in cord and brain as a whole are not of a specific type, but rather those which occur in conditions of chronic intoxication and resemble those found in chronic alcoholism, namely, the occurrence of increased lipoid products in cells, glia overgrowth, vessel changes, miliary hemorrhages and intramedullary fiber degeneration. The similarity to a toxic type is further shown in the axonal type of reaction which was found in two instances, a change which has often been noticed in Korsakow's symptom-complex and various forms of toxic neuritic disorders. As in toxic processes the vessels are severely affected.

Clinically, Barrett points out there are features in these paranoid cases which resemble closely those seen in chronic and subacute toxic conditions, especially the chronic alcoholic delusional state. These are the occurrence of the suspiciousness and irritability, the development of the delusions of persecution, the auditory hallucinations and occasional memory impairment and confabulation.

Williams<sup>1</sup> reports the occurrence of two cases of *psychosis* occurring

<sup>1</sup> Journal of American Medical Association, September 12, 1914.



during the course of *pernicious anemia*. In discussing the cases, he says when we attempt to classify these two cases we find no definite group in which to place them, unless it should be with the intoxication psychoses. To summarize, we have two individuals with well defined pernicious anemia, showing in common many mental signs, namely, lack of orientation, in the one case in every field, and in the other especially in regard to place; lack of insight; such delusions as we commonly meet in paranoid states—those of a persecutory type; the memory in one case apparently normal, until late in the condition, while in the other there was lack of accuracy for both recent and remote events; the mood in both parties much happier than the physical condition would warrant; lack of attention and appreciation, and numerous physical signs, such as parasthesias, diminished sensibilities, vertigo, speech disturbances, loss of functions of the arms and legs, ankle-clonus, unequal patellar reflexes, Romberg signs, unsteady gait. Apart from the abnormal mental conditions present, it is evident that we are dealing with some lesions of the brain and spinal cord, such as have been described by various writers in their reports of cases.

An interesting case of aplastic anemia is reported by Musser.<sup>1</sup> This case presented so typically all the findings of aplastic anemia that the author had no hesitancy in making the diagnosis. The etiology was obscure. So far as he could determine, the patient had been in good health up to the time the anemia was first noted. From then on, the course was rapidly downward and in a short time terminated in death. The only possible etiologic factor was syphilis, but there was no definite proof that the patient has ever been infected; certainly there was no gross evidence of activity of a syphilitic process. A septicemia might be thought of, but there was no primary focus; the temperature was markedly elevated but very regular; the blood-culture was negative. In differentiating the disorder, some type of purpura hemorrhagica might have been diagnosed, but in this case the purpura was undoubtedly a symptom, certainly not a disease *sui generis*, if it ever is; neither was there an antecedent anemia. This, of course, could not be determined absolutely, but, in view of the splendid previous health of the patient, it is safe to presume that she had not been a sufferer from pernicious anemia. These conditions are the only ones which might confuse the diagnosis; but so typical was the blood-picture that the only sequence of events that might have occurred would have resulted from the secondary disablement of the bone-marrow by some toxicosis.

In the study of the blood, three observations, about which very little has been written in this connection, were made:

1. The coagulation time and the bleeding time were both considerably delayed, though in Whipple's case only the bleeding time was prolonged.

<sup>1</sup> Archives of Internal Medicine, August, 1911.

2. Employing the same technique with which he had been working in connection with another problem, no evidence of reticulated or skein-forms of red cells was found. The total absence of these cells would be expected, however, and would tend to show that the conception of Ferrata, Hertz, and others, that these cells are indicative of normal regeneration and are presumably young or unripe forms of red cells is correct.

3. In observing the resistance of red cells to hypotonic salt solution, it was found that the maximal resistance was decreased, while the minimal resistance was unchanged. This may be interpreted as showing that there was almost a total absence of the younger cells, the most resistant of all cells, while the old cells in every respect were normal and, not acted on by hemolysis, preserved the same ability that they normally possess to resist various strengths of hypotonic salt solution.

In summarizing, Musser says that if we accept Pappenheim's idea, a most rational and convincing theory, that all anemias are secondary, there can be no question but that aplastic anemia is a secondary anemia; however, that is secondary to primary marrow-changes alone, and has no relation to the ordinary types of phanerogenetic anemias or to the so-called primary pernicious anemias, which are the result of primary hemolysis. Representing a type of hemopoietic degeneration, as such it should be considered as a nosologic entity and should not be considered merely a type of anemia secondary to some known or unknown hemolytic process. Aplastic anemia is an anemia secondary to marrow-changes which, in turn, are dependent on some known or unknown cause.

Savage and Vincent<sup>1</sup> report a case of pernicious anemia occurring during pregnancy in which the pernicious form of the disease was evident through sixteen months, confirmed by nineteen examinations of the blood. There was evidently a predisposition before the pregnancy, but the latter aggravated the anemia into the severest type, the reds dropping to 600,000. A macerated fetus was expelled and at once the blood picture improved, the reds running up in six days to 3,000,000. The fact that the patient was a syphilitic was not discovered until after several months, but the anemia was manifestly of syphilitic origin. The case impresses the necessity for examining for syphilis in every case of anemia in a pregnant woman.

**TREATMENT.** Florchen<sup>2</sup> has reported four cases of pernicious anemia which show that thorium X may have a marked beneficial effect for a time on the disease by inducing prolonged remissions. In his experience, no cure was realized, and in one of his cases the thorium seemed to accentuate the condition. Splenectomy was resorted to in one case, but the patient died within an hour. In the fourth case, after a remission of four months had been brought about by the use of thorium, the symp-

<sup>1</sup> *Annals de Gynéc. et d'Obstét.*, January, 1914, xvi, 1.  
*Munch. med. Woch.*, June 9, 1914.

toms returned and, in consequence, the spleen was removed. The man has been in apparent health during the seven months since the splenectomy. The hemoglobin increased from 10 to 40 per cent., and the erythrocytes are now present in normal numbers, with megaloblasts, normoblasts, only slight poikilocytosis and very few Jolly bodies. The spleen, in both cases in which it was removed, was only slightly enlarged and no particular changes could be detected microscopically. In 2 cases in which direct transfusion of blood was employed, the benefit therefrom was only transient.

Arneth<sup>1</sup> states that thorium X in small doses not only returns the erythrocyte formation to normal but also acts on the leukocytes in such a way that their number is not decreased, as one would fear, but increased.

Pedenko<sup>2</sup> has treated 3 cases of pernicious anemia by repeated withdrawal of small amounts of blood. The blood is taken from a vein at the elbow in quantities of 50 to 120 c.c. In some cases this venesection was repeated six times at intervals of from ten to seventeen days. He recommends the method as one to be used as a last resort, and it must be looked upon as merely a symptomatic treatment. Its beneficial action is to be explained through its stimulating effect on the blood-forming organs, particularly the bone-marrow. This opinion is borne out by the fact that in 2 of Pedenko's cases the spleen became enlarged after repeated blood-letting. The venesection may be of benefit also through the removal of the toxins present in great quantities in the blood of pernicious anemia. All of his patients showed a marked toxemia, and, even after one blood-letting, improvement was noted, with subsidence of the toxic manifestations.

Mikhailoff<sup>3</sup> has used *splenic extract* with excellent results. He produced an experimental anemia of the pernicious type in eighteen rabbits by the injection of phenylhydrazin. Ten of the rabbits were left without treatment and eight succumbed by the third to the fifth day. The other eight were treated with splenic extract, and, in all, the blood picture returned almost to normal. From these results, Mikhailoff was encouraged, and he carried out the treatment in a very severe case of pernicious anemia in a man, aged twenty-six years, who had had every other known treatment applied without benefit. About 2.5 c.c. of a 2 per cent. solution of an extract of spleen substance was injected. Improvement was noted after the seventh injection and, according to the author, a complete cure was obtained after the fiftieth injection. Six months later the hemoglobin percentage was 95, erythrocytes 5,125,000, the leukocytes numbered 6800, and the color index was 0.9. Equally good results were obtained in two other patients. The

<sup>1</sup> Berl. klin. Woch., 1911, No. 4.

<sup>2</sup> Russk. Vrach., January 25, 1914.

<sup>3</sup> Ibid., June 27, 1914.



author attributes the favorable action of the splenic extract to hormones which stimulate the function of the blood-forming organs.

A number of cases have been reported during the year, both in this country and abroad, in which *splenectomy* has been resorted to in the treatment of pernicious anemia.

Roblee<sup>1</sup> reports 2 cases treated in this manner. In the first case, on May 16, two days before splenectomy was performed, the red cells numbered 1,500,000, hemoglobin 40 per cent., color index 1.4. The stained specimens showed 70 per cent. of polymorphonuclear leukocytes, 28 per cent. of lymphocytes, 2 per cent. of eosinophiles, and there were present normoblasts, megaloblasts, microcytes, macrocytes, and poikilocytes. From the second day after operation the blood steadily improved until on July 10, the erythrocytes were 4,500,000, hemoglobin 90 per cent., the stained specimens revealed that the red cells varied much in size, but there were few over-sized cells. There were large numbers of dwarf cells, some as small as platelets. Those large enough to be properly observed had taken the disk-shaped characteristic of red cells and some of these cells which were not over two microns in diameter showed a marked poikilocytosis. There were a number of normoblasts with small well defined nuclei, but this number was much smaller than that in previous specimens. No megaloblasts were observed. The staining qualities of the red cells were much more uniform. The fragmentation of these cells was much less, and was confined to the larger cells.

In the second case, on May 10, the day before splenectomy was performed, the red cells numbered 1,250,000, the hemoglobin showed a percentage of 65, the color index was 2.6. After operation there was progressive improvement, and on July 10 the red cells numbered 2,880,000, and there was 85 per cent. of hemoglobin. The stained specimens gave very much the same picture as in Case 1. There were normoblasts, megaloblasts, macrocytes, microcytes, and a marked poikilocytosis. After operation there were the same changes which presented in the blood of Case 1. The poikilocytes became less marked; there were fewer nucleated red cells; less difference in the size of the cells and there was the same fragmentation of the centre of the large cells. There were no megaloblasts, the nucleated cells being of the normoblast type.

In concluding, the author states that splenectomy as a curative measure in pernicious anemia is of too recent date to hazard any opinion as to what the ultimate results may be. So far, the case reports do not show that any patient suffering from this disease, upon whom a splenectomy has been performed, has returned to an entirely normal condition, either as to the blood findings or the physical findings. We are justified, he says, in stating that: (1) Splenectomy in primary pernicious anemia,

<sup>1</sup> Surgery, Gynecology and Obstetrics, November, 1911.

even in those who are very ill, does not present any very unusual difficulties. The operation, unless a former splenitis has been present with resultant adhesions, does not cause much shock or inconvenience to the patient. There has been no operative mortality in the published cases. (2) The improvement is immediate and striking, and a comfortable temporary lease of life seems to be assured. (3) In view of the variability of the conditions in cases suffering from this disease, we are not warranted in promising a permanent cure. (4) The immediate results are far more pronounced than is any palliative operation for cancer or other chronic conditions, and, if such an operation is ever justifiable, this operation certainly is indicated. This disease heretofore has been such a hopeless one to combat that any method that can be depended upon to give certain early improvement, and which holds out a hope of permanent cure, is worthy the serious consideration of all medical and surgical practitioners.

Before the Association of American Physicians in session May 12 and 14, 1914, Coleman and Hartwell, of New York, reported a typical case of pernicious anemia that grew steadily worse in spite of four months' treatment with arsenic, iron, hydrochloric acid and four transfusions. Splenectomy was performed as a last resort. Ten weeks later, January 13, neosalvarsan was administered. The use of neosalvarsan made it impossible to draw any conclusions as to the effect of the splenectomy, except in the interval before its administration. In this interval there was no evidence of more than temporary improvement. At the present time, April 24, six months after the operation, the patient, while looking better and feeling better, is just beginning to sit up.

Moffitt, of San Francisco, in a paper before the same body, had collected 31 cases of splenectomy for pernicious anemia from the literature and he reported 8 which were done in San Francisco; 1 in his own service. The results from splenectomy had been variable. In 8 cases death resulted either immediately or soon after operation. A number of other cases had not been improved; in still others reported in literature, surprising improvement had taken place. In his own case, paresthesia, which was obstinate before operation, disappeared at once afterward. There were other striking changes in the blood regeneration which followed soon after operation in many cases. He had had opportunity to study the spleen after operation in 8 cases, and the picture was practically the same in all. Contrary to clinical observations, the weight of the spleen was considerably greater than normal, varying from 450 to 500 gms., and from that point down to 350 to approach the normal of 280 gms. Most observers regarded the size of the spleen in pernicious anemia as not increased, while operative results showed the spleen considerably larger than normal. The recent work on splenectomy, according to the author, should not direct attention from the ultimate causes of the disease. He reported sometime ago the

simulated type of pernicious anemia in man and pernicious anemia in animals such as horses. Since that time he had opportunity to observe some cases in animals and to make serums from the liver and spleen in certain cases. The microscopic appearance of the spleen and liver in these cases was not noticed in the organs removed at operation for pernicious anemia. From a spleen removed in January, an emulsion was made and injected hypodermically into a horse, with no change in the anemia. The operation of splenectomy in horses is difficult. Many arteries went into the spleen and consequently the operation could not be successfully done. He had in mind tying the arteries of horses whose spleens were affected with pernicious anemia, and it would be interesting to observe whether, as in human cases, cutting off the circulation in horses would have any effect in stopping hyperhemolysis, which is characteristic of the disease in animals as it often is in human beings.

Harpole and Fox<sup>1</sup> report a case of pernicious anemia treated by splenectomy and give as their reasons for operating, the following: (1) A case of pernicious anemia steadily going from bad to worse under the usual medical treatment. (2) The presence of an easily palpable spleen which could not be accounted for by previous malaria or other disease. The enlargement of the spleen suggested an hypertrophy due to over activity of the organ, the possibility that the spleen was perniciously active in a function generally credited to it, namely, the destruction of red cells. The case has improved since the operation. The phenomenon of a great increase of nucleated red cells after the removal of the spleen corresponds to the other cases reported. The color index has fallen ever since the operation. The patient received a set-back sixty days after the splenectomy by having an appendicitis with ruptured appendix and somewhat diffuse peritonitis which was treated by appendectomy and drainage from which he made a rather slow recovery. The patient has gone on a trip to the southern part of Illinois, feeling fine, gaining strength rapidly and having a color not noticeably different from the normal.

McKendrick<sup>2</sup> cites a case of pernicious anemia treated by splenectomy on August 28, in which the blood formula on July 26 was: Red cells, 2,550,000; white cells, 7,800; hemoglobin, 25 per cent.; color-index, 0.5; polymorphonuclears, 56 per cent.; small lymphocytes, 36 per cent.; large lymphocytes, 2 per cent.; large mononuclears, 3.6 per cent.; mast cells, 1 per cent.; eosinophiles, 1.4 per cent.; anisocytosis, poikilocytosis, ghost cells, slight polychromatophilia, a few normoblasts and one questionable megaloblast were present. On August 16 examination of the bone-marrow showed a hyperplastic condition. On August 28 the operation of splenectomy was performed, and on August 29, the day

<sup>1</sup> Surgery, Gynecology and Obstetrics, February, 1914.

<sup>2</sup> British Medical Journal, October 3, 1914.



after the operation the blood had altered materially from the last examination. There was a large increase in the red blood corpuscles, a very marked polymorphonuclear leukocytosis and a rush of nucleated red cells (normoblasts). The blood formula at this time was red cells, 4,650,000; white cells, 34,800; hemoglobin, 35 per cent.; color index, 0.38; polymorphonuclears, 94 per cent.; lymphocytes, 5.6 per cent.; eosinophiles, 0.4 per cent.; nucleated red cells, 1800 per cm. The red cells gradually increased to normal. At one time there was a polycythemia while the white cells steadily fell to 9000. The hemoglobin did not increase so rapidly as was expected. As there was some oral sepsis a few teeth were extracted. On November 15 the blood formula was red cells, 4,890,000; white cells, 12,000; hemoglobin, 75 per cent.; color index, 0.8; polymorphonuclears, 62 per cent.; lymphocytes, 27 per cent.; large mononuclears, 5 per cent.; myelocytes, 6 per cent.; no nucleated red cells were found. The patient, who was a female child of eight years, left the hospital well, on April 26, 1914. Over a year after her discharge from the hospital a letter from her family physician said that she had grown and was in good condition. She had a good color, with no trace of anemia, and, in fact, was a normal healthy child of her age, not in the least the poor anemic child that she had been.

Port<sup>1</sup> describes the case of a man, aged thirty-one years, whose blood had the typical features of pernicious anemia even between the exacerbations. The spleen was removed, and although there was considerable loss of blood, it weighed 432 gms. Improvement followed until the time of the report, three months later. The hemoglobin was 77 per cent., the erythrocytes 3,556,000, and the leukocytes 9500, and there were few Jolly bodies where at first they were extremely numerous.

Muhsam<sup>2</sup> reports a personal experience with 11 cases of pernicious anemia treated by splenectomy. Three of the patients died, one man and one young woman succumbing to the excessive hemorrhagic tendency accompanying the disease. Two have died since, one from myelitis. The other patients are in good health today. They all gained materially in weight and strength, and the blood picture had improved in all, but had not returned to the normal.

G. Klemperer<sup>3</sup> says that splenectomy in internal diseases, with spleen of normal size, is one of the latest innovations in internal medicine. It is less than a year since the first operation of the kind was done for pernicious anemia, and he has already ten cases to report. One elderly woman with preëxisting pneumonia and a young woman with advanced heart disease did not survive the operation. The eight others

<sup>1</sup> Berlin. klin. Woch., March 16, 1914.

<sup>2</sup> Deut. med. Woch., February 19, 1914.

<sup>3</sup> Therapie der Gegenwart, Berlin, January, 1914, lv.

were in the last stages of pernicious anemia, but all showed marked improvement, both in general health and in the blood picture after removal of the spleen. The benefit became progressively evident, and in one case amounted to a clinical cure; in the others, the blood still shows the characteristics of the pernicious anemia type notwithstanding the great improvement.

Decastello,<sup>1</sup> in concluding a long discussion of the influence of splenectomy on pernicious anemia, says that splenectomy almost surely brings about an improvement, not only in the blood picture but in the general condition of the patient, but does not lead to a return to entirely normal conditions. This improvement is not to be looked upon as a cure, but as a remission. We cannot yet assume that with the removal of the spleen the specific cause of the disease is removed, and that pernicious anemia is called forth through a primarily increased hemolytic power of the spleen. The action of the operation can rather be looked upon as a nutritive stimulation of the bone-marrow through changes brought about in the metabolism by removal of the spleen.

**The Spleen.** Studies on the spleen, especially in its relation to hemolysis have been numerous and noteworthy during the past year. Following splenectomy, King<sup>2</sup> found that there occurs an increase in the total fats and cholesterol in the blood, and also a reduction in the value of the iodine number (that is, a lower iodine number). In clinical conditions associated with hemolysis, pernicious anemia, hemolytic jaundice, catarrhal jaundice, and some forms of cirrhosis of the liver, there is found a decided increase in the value of the iodine number. There appears to be a parallelism between the highly unsaturated fatty acids in the blood and hemolysis. The occurrence of these highly unsaturated fatty acids is intimately dependent on the activity of the spleen, for removal of that organ reduces the iodine-combining value of the unsaturated fatty acids and renders the production of icterus by hemolyzing agents more difficult. Also, it greatly improves clinical conditions in which hemolysis is at work. This is interpreted to mean that the spleen may be the central point in many diseases in which hemolysis and anemia, are active, especially in pernicious anemia. This organ may be conceived to take on an increased function as regards its hemolytic activities, resulting in hemolysis, anemia, and icterus.

The condition of asplenism presents, in some of its features, a diametrically opposite picture. Animals in this condition are more resistant to hemolyzing agents, and icterus is much more difficult to produce. The increase in the total fats and lipoids following splenectomy may explain the increased resistance of the red blood cells found to accompany the condition of asplenism. These substances have definite anti-hemolytic properties. In pernicious anemia, hemolytic jaundice, some

<sup>1</sup> Deut. med. Woch., April 2, 1914.

<sup>2</sup> Archives of Internal Medicine, August, 1914

types of catarrhal jaundice and cirrhosis of the liver, the hyperactive spleen unfavorably influences the anemia, through its regulation of the highly hemolytic unsaturated fatty acids in the blood. Its removal appears, therefore, to be indicated. Splenectomy of itself, besides influencing the hemolytic unsaturated fatty acids, raises the percentage of antihemolytic substances in the blood; that is, the total fats and cholesterin. King concludes that the fact that total removal of the spleen is not followed by any symptoms dangerous to the life of the patient has probably drawn attention away from the consideration that states of diminished function of this organ may exist.

Morris<sup>1</sup> examined carefully the blood entering the spleen and compared it with that emerging by the splenic vein. His results all point to the inevitable conclusion that the spleen is a blood-forming organ of prime importance in the animal metabolism. The fact that the organ can be extirpated without causing death or even considerable detriment to the animal organism does not militate against this conclusion. Other organs (hemolymph nodes, bone-marrow, and adenoid tissue in general) may assume part of the role of the spleen when this is absent, but only the severity of the blood-destroying agent and the individual resistance can determine whether the body can stand the strain when deprived of the spleen. Cases of death from removal of the malarial spleen indicate this strongly.

Krumbhaar and Musser<sup>2</sup> conclude that the slight differences between the arterial and venous blood of the spleen are within the limits of error in the methods of blood examination and are not to be explained by a peculiar action of the spleen. In some instances peculiarities shown by the venous blood are common to the venous blood of the general circulation. Banti and Furno's observation concerning the presence of free hemoglobin in the blood of the splenic vein is not confirmed.

They also found that fresh extracts of spleen are devoid of definite hemolytic action. Occasional trivial and irregular results, not to be explained, are found, but these occur likewise in the control extracts of liver and mesenteric lymph nodes. Twenty-four-hour extracts, prepared at low temperature, show little or no increase in hemolytic activity. Boiled splenic tissue, extracted in the cold for twenty-four hours, is inert.

Intraperitoneal injection of saline extracts of fresh spleen constantly causes a sharp increase in red cell count and hemoglobin content. The rise is evanescent, lasting but one or two days, and may be followed by an equally evanescent drop below normal. Similarly prepared extracts from other organs fail to give this rise. No noteworthy change is found in the resistance of the red blood cells to hypotonic salt solution, or in the number of skeined or reticulated erythrocytes, after the in-

<sup>1</sup> Journal of Experimental Medicine, October, 1914, xx, 4.

<sup>2</sup> Ibid., August, 1914, xx, 2.



jections of the various organ extracts. A temporary increase of polymorphonuclear and transitional leukocytes usually follows the use of spleen extract, but may occur also, though less frequently, after the injection of liver and kidney. The constant increase of red cells in the peripheral circulation after injection of spleen, in view of the tendency to anemia following splenectomy, suggests that the spleen normally may exert a stimulating effect on the formation of red cells in the bone-marrow. The feeding of fresh, raw spleen to splenectomized dogs has no clearly defined influence in preventing the anemia which usually occurs after splenectomy.

Pearce and Pepper<sup>1</sup> have examined the bone-marrow of splenectomized dogs with a view of determining the compensatory or other changes following the removal of the spleen. The material consisted of marrows representing periods varying from three weeks to twenty months after splenectomy. During the early periods, one to three months, the change in the marrow is slight and either focal or peripheral; after six to twenty months the replacement of fat by marrow cells is complete, or nearly so. Exceptions were, however, seen in four animals representing the eighth, ninth, tenth, and twenty-second months respectively. The evidence at hand does not support the theory that this hyperplasia is compensatory either to the anemia caused by splenectomy or to an increased hemolysis in the lymph nodes. The authors suggest that it may be a concomitant of the activity of the bone-marrow in taking over, in the absence of the spleen, the function of storing and elaborating the iron of blood pigment for future utilization by new red cells, but their studies do not fully support this view.

Austin and Pearce's<sup>2</sup> studies give evidence of increase in the iron elimination in three of five dogs during a period of two weeks following splenectomy, but not in two other dogs. The occasional increased output of iron may have some relation to the anemia which occurs in the early weeks after splenectomy and which varies in degree in different animals. No evidence was secured of an increase in the iron output at one, nine, and twenty months after splenectomy. From their own studies, and from examination of the literature of the subject, the authors conclude that the spleen does not exercise a constant and important influence on the iron metabolism of the body.

Hirschfeld and Weinert<sup>3</sup> had opportunity to study the red corpuscle production after splenectomy in 15 cases and found that it had a marked influence on the appearance of Jolly bodies. There is evidently some close connection between the spleen and these bodies, and their behavior in anemias should receive more attention.

Meyer<sup>4</sup> believes there is much evidence to sustain the assumption

<sup>1</sup> *Journal of Experimental Medicine*, July, 1914, xx, 1.

<sup>2</sup> *Ibid.*, August, 1914, xx, 2.

<sup>3</sup> *Berl. klin. Woch.*, June 1, 1914, li, 22.

<sup>4</sup> *Centralblatt für die Grenzgebiete der Med. und Chir.*, January 15, 1914, xviii, 1.

that the spleen, in addition to its other functions, produces a substance which promotes peristalsis.

Karsner, Amiral, and Bock,<sup>1</sup> from their investigations of the influence of splenectomy, have found that, provided the spleen has been removed for a period of time less than a week and more than two days, the intravenous injection of a specific hemolytic immune serum, in doses large enough to produce hemoglobinuria, is followed by marked phagocytosis of erythrocytes by the endothelial cells of the lymph nodes and liver. In the lymph nodes the process starts about three hours after the injection of immune serum, reaches its height about twenty-four hours after the injection and is practically complete in forty-eight hours, when the endothelial cells are found to contain large quantities of pigment, presumably as the results of blood-destruction.

A study of hemopsonins of the blood serum under the experimental conditions indicated in the text fails to show that the phagocytosis of erythrocytes, so prominent in the lymph nodes of the splenectomized animal following a fairly large intravenous dose of specific hemolytic immune serum, is dependent on local or general variations in hemopsonin in the splenectomized animal as influenced by organ extracts of normal and of splenectomized animals.

Turk<sup>2</sup> discusses the spleen as a factor in anemia. He has encountered several cases in which there could be no doubt that a tumor in the spleen was responsible directly or indirectly for the production of toxins which had a decidedly injurious action on the bone-marrow. The consequence of this toxic functional disturbance in the blood-forming apparatus was a kind of anemia with none of the features of hemolysis. The removal of the spleen does away with the source of the toxins in this case. The benefit from splenectomy in Banti's disease—which seems to be an anemia of this type—confirms this assumption.

The spleen may become enlarged in consequence of an old pylephlebitis which may be traced to infection of the umbilicus soon after birth. This may lead to hemorrhage from the enlarged veins in the gastro-intestinal mucosa, with severe anemia as the result. He has encountered a number of cases of this kind since the one he reported in 1902; there is nothing in the clinical picture or case history here to suggest that any toxic injury of the bone-marrow may be responsible for the anemia or any process of hemolysis. Removal of the spleen under these conditions would be absolutely futile, while it would be fraught with great danger on account of the extreme congestion in the splenic vein. When there is excessive destruction of blood in the spleen-liver system, there is no bile in the urine, but bilirubin is found in the blood, urobilin in large amounts in stools and urine, and the bone-marrow shows signs of hyperfunctioning. This familial hemolytic

*Journal of Medical Research*, July, 1914, xxx, 3.

*Deut. med. Woch.*, February 19, 1914, xl, 8.

jaundice may, in one member of the family, cause merely enlargement of the spleen, without jaundice or much anemia; another may have the enlarged spleen, anemia and urobilinogenuria but no jaundice, and a third may have all the above but with less fragile reds. The same symptoms characterize the type which develops without any known inherited tendency. In one such case it came on in childhood after a septic scarlet fever. The exacerbations may resemble gall-stone trouble, and the anemia may assume the pernicious type during the exacerbations: They are inclined to be more abrupt than in the familial type. In all these hemolytic groups the removal of the spleen has proved the means of curing most, if not all, of both the subjective and objective disturbances; only occasionally the reds may still display a certain fragility.

The results of splenectomy in such cases point unerringly to the spleen as the cause of the trouble, and show that any symptoms on the part of the liver can be readily explained as secondary to the spleen affection. This suggests that possibly splenectomy might help in morbid conditions in which the liver seems to be playing the more important role, and in fact this has proved to be the case in Hanot's cirrhosis of the liver, with hypertrophy and recurring paroxysmal attacks resembling gall-stone mischief, but without anemia. Eppinger has reported several cases of a practical cure after splenectomy, and full earning capacity restored after long, serious illness for periods up to ten years.

With pernicious anemia, splenectomy induces a marked change for the better, but the blood does not return to the normal type; the patients are much improved but in none of the 7 cases in which splenectomy has been done for pernicious anemia during the last ten months has the blood picture returned to normal. A remarkably rapid and thoroughgoing remission may almost be counted on in apparently almost moribund patients; it acts more rapidly than arsenic and as promptly as thorium, but it does not seem to remove the cause of the pernicious anemia. The morbid spleen functioning is merely one link in the chain of factors causing the disease, but by removing it we make a gap in the chain and even this is a great gain.

**Hemolytic Jaundice.** McNee,<sup>1</sup> from his experiments, is led to believe that there is no doubt that no marked icterus occurs after removal of the liver in geese which have been poisoned with Arsin ( $\text{AsH}_3$ ). The weak icterus which occurred in some of his experiments after removing the liver, he believes must depend either on the functional activity of the spleen and bone-marrow, or on continued activity of the small piece of liver tissue left behind the vena cava. The reason why no marked icterus follows extirpation of the liver is not that the liver cells have been removed, but depends on the removal of the tissue enclosed within the liver which breaks down hemoglobin, namely, the endothelial

<sup>1</sup> Journal of Pathology and Bacteriology, Cambridge, January, 1914, xviii.



cells of v. Kupffer. These cells have, at any rate, to do with the first phase in the production of bile, since they split off the iron part of the hemoglobin molecule and set free the pigment portion.

Neither from the experiments of Minkowski and Naunyn, nor from his own, can McNee draw a definite conclusion that a true hemolytic icterus cannot occur at all. On the contrary, the histologic appearances, especially the proliferation and desquamation of the Kupffer cells, their circulation in the blood-stream, and their destruction there, speak strongly in favor of the occurrence of an icterus without any action of the liver cells at all.

An important question, McNee says, is how far these conclusions arrived at by experiments on geese can be applied to human pathology. Experiments certainly show that the structure of the liver is different in birds from that in higher animals. Quite apart from the relative difference in size of the organ in birds, there is in them a very special iron metabolism in the liver, with which, not the liver cells but the endothelial cells lining the vascular capillaries, have to do.

The appearances in a hemolytic icterus induced by toluylendiamine in dogs are not in any essential feature different from what he has observed in geese. The chief point of difference is that normal structure in dog's liver is different from that of birds. In dogs, the endothelial Kupffer cells are much less numerous, and normally give no iron reaction. Thus, in dogs, the liver does not seem to be so directly associated with the iron metabolism as it is in birds. It is likely, McNee suggests, that the spleen in higher animals has taken on this function. But in icterus the endothelial cells of the dog's liver show changes quite similar to those found in geese, namely, phagocytosis of red corpuscles, disintegration of them and appearance of a diffuse iron reaction in the protoplasm. The cells being much fewer in number, these appearances are not so prominent and readily recognized.

In the spleen the changes seen in dogs and geese during icterus are also similar, but it has been sufficiently emphasized already how much larger an organ the spleen is, comparatively, in higher animals than in birds. In the lymph nodes of dogs the changes are also very marked, and of a similar nature to those found in the spleen. In geese, it was generally a matter of extreme difficulty to find lymph nodes at all, and hence no observations were made on them. Taking all these points into consideration, it seems to McNee quite probable that, with modifications depending on the different importance of the spleen, all that he has suggested in connection with the etiology of hemolytic icterus, from his experiments on geese, can be applied to higher animals and to man.

THE CHAUFFARD TYPE (*Congenital, Familial*). Among 20 cases of hemolytic jaundice observed by Chauffard,<sup>1</sup> only one-half of them could

<sup>1</sup> *Annals de Médecine*, January, 1914.

be recognized as of the familial type and not all of these were congenital. The evidence from his observations on the congenital type of the disease seems to point conclusively to an inherited taint of syphilis or tuberculosis on which is superimposed some abnormal hemolytic action on the part of the spleen as the factors responsible for the hemolytic jaundice. This suggests the necessity for specific treatment, either against the syphilis or tuberculosis, in conjunction with reduction of the splenic function through Röntgen exposure. Splenectomy should be considered only as a last resort.

Lindbom<sup>1</sup> reports a case of the familial type of hemolytic jaundice occurring in a young woman. The attacks of pain and marked jaundice had long been attributed to gall-stones. On investigation, 5 other cases were found in the same family—three sisters, her mother and her grandmother all had more or less jaundice dating from early childhood. Along with the jaundice there was more or less anemia, with the characteristic blood findings. In this case the author has considered a course of treatment with cholesterin, daily doses of 1.5 gms. being given dissolved in oil. If this procedure fails, Lindbom proposes exposing the spleen to the Röntgen rays, or, as a last resort, will employ splenectomy.

Parkes Weber<sup>2</sup> reports a case of familial splenomegaly with anemia, increased fragility of the cells, and jaundice of an intermittent type. He complains of the difficulty of diagnosis of a case like this from one of the Gaucher type of primary splenomegaly. He suggests the name splenomegalic anemia for cases in which the jaundice disappears, though the splenomegaly and characteristic blood features remain. The case reported was associated with infantilism.

**Chronic Splenic Anemia and Banti's Disease.** The differentiation of the various splenomegalies and splenic anemias has been possible only during late years. Rolleston,<sup>3</sup> in a description of chronic splenic anemia and Banti's disease, points out the difference between these two conditions in addition to a discussion of their pathology and clinical symptoms. He defines chronic splenic anemia as presenting the following characters: (1) Chronic splenomegaly which cannot be correlated with any recognized cause; (2) absence of enlargement of the lymphatic glands; (3) chlorotic anemia, namely, with a low color index; (4) absence of leukocytosis, and usually the presence of leukopenia; (5) liability to copious gastro-intestinal hemorrhages from time to time; (6) a prolonged course without any tendency to spontaneous cure, though splenectomy (if successful) is usually curative.

The title Banti's disease is now often used as synonymous with splenic anemia, even by those who fully recognize that it is a sequel or terminal

<sup>1</sup> Hygiea, Stockholm, April 1, 1914.

<sup>2</sup> British Journal of Children's Diseases, August, 1914.

<sup>3</sup> The Practitioner, April, 1914.

stage of splenic anemia, and does not occur in all cases, even when unduly prolonged. It is true that Banti regarded splenic anemia as the antecedent of his "splenomegaly with cirrhosis," and that it may, therefore, be spoken of as the early stage of Banti's disease; but, surely, it is better to restrict the name Banti's disease to cases with hepatic cirrhosis as the sequel of chronic splenic anemia, which this eminent physician was the first to describe. As defined above, chronic splenic anemia is distinct from the mere association of chronic splenomegaly and anemia, especially from von Jaksch's anemia pseudoleukemica infantum.

In the past, the peculiar large-celled hyperplasia of the spleen, or Gaucher's disease, has usually been included in chronic splenic anemia, but its peculiar morbid lesions and, according to Brill and Mendlebaum, its clinical features entitle it to a separate nosological niche. The inclusion of cases of Gaucher's disease among those of chronic splenic anemia has vitiated some statistics, such as my own in 1902, by exaggerating the average weight of the spleen and the duration of life in true splenic anemia.

The introduction by Chauffard, in 1907, of a method for estimating the fragility of the red blood corpuscles isolated hemolytic jaundice, which had previously been included in chronic splenic anemia. Thus, C. Wilson's cases of hereditary enlargement of the spleen have often been regarded as splenic anemia. After the rigid exclusion of all the conditions which may imitate chronic splenic anemia, the remaining cases may still further be divided into (*a*) those which show splenic fibrosis and fibro-adénie, and will eventually be complicated by hepatic cirrhosis, or the third stage of Banti's disease; (*b*) those in which the spleen does not show these changes, and in which hepatic fibrosis does not occur even after many years. Cases which have lasted considerably longer than the first and second stages of Banti's disease (five to seven years) have been reported by Osler, Marchand, Umber, Léon-Kindberg and May, and others. Banti himself recorded a case of fourteen years' duration when cured by splenectomy.

Jack and Frew<sup>1</sup> report two cases illustrative of splenic anemia and splenectomy. The diagnosis of splenic anemia made in the first case would appear to be justified according to the authors by the symptom-complex, by the pathological findings in the spleen, and by the favorable result of splenectomy. To all of the conditions which Rolleston cites as definitive of chronic splenic anemia, this case conforms with the exception that no gastro-intestinal hemorrhages occurred. These, however, may have appeared at a later stage had the case been allowed to run an uninterrupted course. Usually the duration of splenic anemia is long, over ten years in Osler's series of 15 cases. The other conditions which may simulate this disease, leukemia in the aleukemic stage, syphilis

<sup>1</sup> Glasgow Medical Journal, November, 1914.



of the liver and spleen, etc., may be excluded in this case by the results of the blood examination, by the absence of the enlargement of the lymphatic glands, and by the negative Wassermann reaction. The diarrhea present on several occasions during the last three years is a symptom, according to Banti, which occurs in the transitional stage between splenic anemia and Banti's disease, and this would accord with the fact that there was a slight enlargement of the liver which is not commonly present in uncomplicated splenic anemia. The condition of the spleen would also bear out this assumption, although there was slight thickening of the trabeculæ. The main increase was in the reticulum of the pulp and its contents, the condition, in fact, of fibro-adénie, which is a precursor of the development of portal cirrhosis. To justify splenectomy, the diagnosis of splenic anemia must be certain, and medicinal treatment must have failed. The operation is a severe one and has a considerable mortality, which, however, may possibly be lessened by its performance at an early stage of the disease. Its results in other forms of splenic disorder are at least questionably beneficial, and, in certain conditions, it may be directly harmful. The diagnosis is often a matter of some difficulty which is illustrated by the second case in which the conditions postulated by Rolleston were nearly fulfilled. There was chronic splenomegaly which could not be correlated with any recognized cause. There was absence of enlargement of the lymphatic glands. There was chlorotic anemia with a low color index. Although leukopenia was not present except on one occasion just after a severe hemorrhage when all the elements of the blood were reduced, there was an absence of leukocytosis. Copious gastro-intestinal hemorrhages were present, and, if it be assumed that the occasional vomitings which preceded them were really symptoms of the disease, it had lasted at least eighteen months. Yet there were features in the case which made the diagnosis uncertain. One of the authors was inclined to consider the symptoms as due to thrombosis of the splenic vein, possibly complicating splenic anemia. The other from the results of the differential blood counts, and from the constant presence of sub-febrile temperatures, which are unusual in splenic anemia, leaned rather to the view of acute leukemia in an aleukemic stage. The postmortem examination revealed the former opinion to be more nearly in accordance with the anatomical lesions, but the true diagnosis, namely, an old-standing and extensive portal thrombosis, which from the character of the thrombus must have been in existence at least for several months, and which may possibly have originated in the irritation of a long latent duodenal ulcer, was not suspected during life.

The authors deem it unnecessary to do more than indicate that if, on a merely probable diagnosis of splenic anemia, the operation of

splenectomy had been performed in such a case as this, the results could not have been other than disastrous.

ETIOLOGY. Caronia<sup>1</sup> has systematically applied the Wassermann test to the parents of thirty children who have come under his observation suffering with splenic anemia during the last year. In 19 instances he obtained a positive response. In 9 instances tuberculosis accompanied the syphilis in the family. In two cases tuberculosis was present without syphilis. He believes the assumption justified that still other causes may bring on splenic anemia in children, chief among which probably is sepsis of a chronic nature.

Gibson<sup>2</sup> has found in the spleens of 6 cases, 3 with a picture of Banti's disease, 2 with splenic enlargement and fibrosis, and 1 with splenomegaly, a parasitic invasion of the organ by a streptothrix organism. This was found in such relation to the affected parts, at least in the cases of Banti's disease, as to leave no doubt that it was the cause of the pathologic condition. He examined many other spleens, several of which had pigmented spots, but none showed the same appearance. Two different appearances are described, one being present in 4 cases; the other in 2, which at first sight suggested two different species of streptothrix. No cultural proof has yet been obtained that these structures are parasites.

Yates, Bunting and Kristjanson<sup>3</sup> have found pure cultures of diphtheroid organisms apparently identical with, or closely related to, the *Bacillus hodgkini*<sup>4</sup> in two spleens removed surgically in the treatment of splenic anemia. Histologic studies confirm the clinical diagnosis of splenic anemia or the early stage of Banti's disease. Inoculation of dogs and rabbits was made with cultures obtained from Case 2, and with the culture obtained from a lymph gland of a case of Hodgkin's disease in which the diagnosis had been confirmed histologically and hematologically. In each case there were produced changes that were characteristic of the disease as described by Banti. These findings appear significant in view of the findings of Gibson. The authors believe the following clinical evidence seems confirmatory of the importance of the observations cited. Atrophic cirrhosis of the liver as a complication of the more usually accepted glandular variety of Hodgkin's disease has been observed repeatedly, but is infrequent. Early stages of a periportal connective tissue overgrowth have, however, been noted comparatively often in the more chronic cases. This rarity of advanced cirrhosis in Hodgkin's disease is probably due, as Klein has suggested, to the fact that life is, as a rule, insufficiently prolonged. In anemia splenica (Banti's disease) the first stage usually lasts from three to five

<sup>1</sup> *Pediatrics*, Naples, October, 1914.

<sup>2</sup> *Quarterly Journal of Medicine*, London, January, 1914.

<sup>3</sup> *Journal American Medical Association*, December 19, 1914.

<sup>4</sup> See *PROGRESSIVE MEDICINE*, June, 1913, p. 361.

years, a period quite in excess of the average duration of life in anemia lymphatica (Hodgkin's disease). This difference in duration, and, in addition, the relatively greater concentration of toxins in portal circulation in Banti's disease may explain why Laennec's cirrhosis is the constant terminal feature in the latter condition. In the clinical course of splenic anemia as described by Banti, there is the characteristic alternation of periods of progression and remission which one of the authors has described as so constantly present in Hodgkin's disease and has attributed to variations in the degrees of toxemia. There is the striking difference of greater chronicity in the former condition. Moreover, in splenic anemia recurrent fever has been noted which may correspond quite exactly with the febrile stage first described by Murcheson but commonly designated as Pel-Ebstein.

Banti recognized that splenic anemia might be accompanied by lymph gland enlargement in later stages and that the changes in the spleen in this affection and in pseudoleukemia spleno-lymphatica were similar; wherefore he thought it possible to regard anemia splenica as a form of pseudoleukemia splenica. In other words, Banti's disease might be Hodgkin's disease of the spleen. The foregoing bacteriologic, histologic, hematologic and clinical evidence seems to warrant the conclusion, according to the authors, that splenic anemia, or Banti's disease, and Hodgkin's disease are closely related if not only variations in manifestation of a single type of infection.

Sailer<sup>1</sup> reports 3 cases of Banti's disease in which splenectomy was performed. Two of the patients recovered, but the third died, death being probably due to the massive hemorrhages which preceded operation in this case. One patient had no massive hemorrhage but had occasionally severe attacks of pain in the abdomen, after which occult blood could be detected in the stools. On one occasion this patient had an attack of pain in the left flank following which blood was noted in the urine, from which Sailer concluded that a small renal hemorrhage had occurred. The interesting features of the first case were its comparatively brief course, two and one-half years; the severe paroxysms of pain which could be ascribed to hemorrhages, not only from the gastrointestinal tract but also from the kidneys; the large size attained by the spleen in a short time; the absence of any macroscopic sign of changes in the liver at the time of operation, and a prolonged and complicated postoperative period with apparent ultimate recovery.

Other cases of Banti's disease, with apparent cure following splenectomy, are reported by Sturgis<sup>2</sup> and Herrick,<sup>3</sup> and a case of the disease with death following splenectomy is reported by Ramsey.<sup>4</sup>

<sup>1</sup> Pennsylvania Medical Journal, November, 1914.

<sup>2</sup> Boston Medical and Surgical Journal, May 28, 1914.

<sup>3</sup> Annals of Surgery, May, 1914.

<sup>4</sup> Texas State Journal of Medicine, September, 1914.



**Gaucher's Disease.** Splenomegaly of the Gaucher type was discussed in these pages rather fully during the last two years. This year Reuben<sup>1</sup> reports 3 cases occurring in the same family. Erdman and Moorhead<sup>2</sup> report 2 cases, and other cases are reported by Sheffield<sup>3</sup> and by Herrman, Roth and Bernstein.<sup>4</sup>

**Hemorrhagic Diseases. Purpura, Hemophilia, Melena Neonatorum.** The literature of the past year in this province has not been very extensive. Considerable experimental work has been carried out regarding coagulation and the various factors involved in the process. Few cases have been reported and little has been written on the treatment of these conditions.

Lee and Vincent<sup>5</sup> have been able to demonstrate, experimentally, that the fundamental principles in coagulation, as studied by Bordet and Delange in rabbits' blood, also hold true for normal human blood. The differences which they found are minor ones. They have found that thrombin requires a longer time for its formation in human blood than in rabbits' blood, and that the minimum amount of serozyme required to permit coagulation to ensue is larger in human blood than in rabbits' blood.

They have been unable to confirm the work of Bordet and Delange on the use of peptone as cytozyme. This is probably due to differences in the preparation of peptone.

Although their argument is open to possible objections, they have shown that white corpuscles can be used as cytozyme; they are perhaps not as efficacious as blood platelets or tissue juice. They have not been able to employ as cytozyme the heated muscle juice of non-human animals in their work on human blood. This is somewhat different from the findings of Bordet and Delange, and tends to confirm their suggestion that there is a certain amount of specificity in the action of the various elements of coagulation. Lee and Vincent found that serozyme is intimately associated with the globulins of the blood.

Ledingham<sup>6</sup> has been able to produce a condition resembling purpura and presenting other features of the hemorrhagic diathesis in guinea-pigs by inoculating them with an antiserum prepared by immunizing rabbits with guinea-pig blood platelets. In the beginning of his work he produced an antiserum for human blood platelets which contained agglutinins for human blood platelets and also for human red cells. In the presence of this serum, phagocytosis of the blood platelets occurred, but the serum did not appear to be very powerful in this direction, and it was felt that another system might be employed with advantage.

<sup>1</sup> American Journal of Diseases of Children, November, 1914.

<sup>2</sup> American Journal of the Medical Sciences, February, 1914.

<sup>3</sup> Archives of Diagnosis, July, 1914.

<sup>4</sup> Archives of Pediatrics, May, 1914.

Archives of Internal Medicine, March, 1914.

<sup>5</sup> Lancet, June 13, 1914.

In view of the difficulty of obtaining sufficient human blood from which to isolate the platelets in any great quantity rendering it impossible to effect an intense immunization of the rabbits, he resorted to the blood of the guinea-pig. This he obtained in ample amount. From the blood of twenty to thirty guinea-pigs a yield of about 0.5 c.c. to 1 c.c. volume of white blood platelet deposit was usually obtained. At each inoculation the rabbit received either one-half or the whole of this amount in saline suspension. Seven to eight injections were given intravenously at intervals of six to eight days. Agglutination of guinea-pig blood platelets by means of this serum was obtained in dilutions as high as 1 to 128. The red cells were also intensely agglutinated. After intravenous inoculation of the serum, the guinea-pig died within one and one-half hours. Postmortem, free blood was found in the peritoneal cavity and on the surface of the liver. The blood from the heart emerged as a purplish granular fluid in which the red cells were completely agglutinated. This blood clotted quite normally, but the clot showed little tendency to retract. After intra-peritoneal inoculation of the serum the animal became sluggish within an hour. On the following day it recovered and remained well for two days, but on the fourth day it was found dead. Numerous subcutaneous hemorrhages were noted in the abdominal wall, the peritoneum contained free blood and there were extensive hemorrhages in both tunicae vaginales. The blood from the heart had a purplish granular appearance. Subcutaneous inoculation of the serum yielded the most striking results, and was employed repeatedly. The picture obtained was almost invariably the same. Subcutaneous inoculation in the groin of 1 c.c. of the serum gave rise, on the following day, to a hard, subcutaneous swelling extending to the centre of the abdomen. On the next day the swelling extended to the lower part of the sternum, and on the third day to the neck. As a rule, this swelling became softer as the disease progressed. Purpuric spots were noted on the external skin after parting the hair in white animals. On the third or fourth day the animal usually died. Postmortem, extensive hemorrhagic infiltration was found over the front of the abdominal wall. Numerous petechiæ were present in other remote parts. The author states that further exact studies are to be made of this interesting condition.

In a discussion of the visceral lesions of purpura and allied conditions, Osler,<sup>1</sup> from an anatomical standpoint, divides the skin lesions met with into four categories: (1) purpura which is the most common lesion and is either simple or associated with swelling, purpura urticans, and with edema of the hands and feet or about the joints; (2) effusions of serum alone; (3) erythemas either diffuse, with or without swelling, or localized; (4) necrotic areas which occur from an intense infiltration of

<sup>1</sup> British Medical Journal, March 7, 1914.

blood or serum in a patch of considerable size with a breaking down of the superficial layers of the skin, leaving an open ulcer. The visceral lesions consist of two types: (1) the mechanical, due to the presence of exudate; (2) the inflammatory. The cerebral manifestations he places in two groups, the one with transient attacks of paresis, such as occur in Raynaud's disease or arteriosclerosis, the other in which paralysis is due to coarse hemorrhage. In his reference to the ocular lesions, he says the cases under consideration indicate how serious these lesions may be. Under this heading he cites cases illustrating recurrent pupura for years with hemorrhage from the conjunctiva; pupura hemorrhagica with hemorrhages into the right eye and detachment of the retina; recurring colic and angio-neurotic edema, with erythema on and off for five years followed by freedom for a couple of years and recurrence, with iritis, retinal hemorrhages, ophthalmitis, and eventual removal of the eye; a case illustrating, on the third day of a febrile attack, the occurrence of pupura, iritis with ocular hemorrhage and blindness; a case of pupura with colic, infiltrated areas of the skin, with necrosis, accompanied by acute iritis and capsulitis.

In discussing the gastro-intestinal symptoms, he states that these are the most distressing, though not the most dangerous of the visceral complications. The name of Henoch is given when associated with pupura, though these symptoms may occur with any number of the erythema group of skin lesions. The manifestations may be for years abdominal without skin eruptions. The conditions under which the gastro-intestinal crises occur, he divides into six groups: (1) cases showing no skin lesions; (2) cases in which they occur in association with hemophilia; (3) those associated with ordinary urticaria; (4) those with angio-neurotic edema; (5) the largest group in which the gastro-intestinal symptoms occur in connection with simple pupura, with or without urticaria. Today, he says, the frequency with which these attacks are mistaken for appendicitis makes the condition important; the last group consists of those cases complicated by intussusception. The renal complications he considers the most serious of all. This class he divides into three groups: (1) those which run an acute course, with dropsy, resulting in death from uremia within three months; (2) the albumin disappears and the patients get perfectly well; (3) those cases in which the nephritis becomes chronic. In speaking of the cardiac complications, he notes that heart murmurs are common and usually of little consequence in debilitated or anemic children. Endocarditis may be a complication of the infectious purpuras, rheumatic or septic. Respiratory complications are not common in the various forms of pupura, but, in Osler's series, several cases were very remarkable, and serious features were present. Among other complications he mentions enlargement of the spleen and swelling of the liver, and he notes that parotitis is not uncommon in the acute



infections with which purpura is associated, such as malignant endocarditis and pneumonia.

A study of the *relation of fat acids to coagulation* has been made by Stuber and Heim.<sup>1</sup> They found that there is a direct connection between the fat-splitting and the coagulation-inducing properties of ferments. Steapsin has shown to be the most active in both lines. Chemically pure stearic acid, and tristearin in a lesser degree are able to induce coagulation of the blood as promptly as, or even more effectually than, thrombokinese. In respect to their action on the coagulation of the blood, the fat acids can be classified in a homologous series, their place in which is determined by the number of carbon atoms in the molecule. The cessation of coagulation by Leech extract comes under the workings of this law. The first phase of the coagulation process is thus a lime-fat soap production; the second phase is the lime-fat soap fibrinogen, the lipolytic ferment serving as a catalyzer. The latter—blood-lipase—seems to be under the influence of certain glands with an internal secretion.

Howell<sup>2</sup> found that prothrombin may be precipitated by acetone from oxalated blood-plasma, and he obtained it in solution free from the other fibrin factors, with the possible exception of traces of antithrombin. The prothrombin is converted into active thrombin in the presence of calcium salts. No third factor seems to be necessary for this activating process. The activating property of calcium salts is exhibited to a much less extent by strontium salts, and very feebly by magnesium salts. The prothrombin in salt-free or salt-poor solutions is weakened, but not destroyed, by heating to 60° C. Aqueous extracts of the blood-platelets show the presence of both prothrombin and thromboplastin. Prothrombin (probably some thromboplastin also) is contained in the plasma of circulating blood. In shed blood, disintegration of the platelets furnishes an additional supply of prothrombin and thromboplastin.

In an investigation of the *effect of temperature on the action of thrombin and antithrombin*, Howell<sup>3</sup> found that with temperatures approximating the body temperature, the action of antithrombin is greatly augmented. It is probable that this action is of importance in insuring the fluidity of the circulating blood in animals like the mammals in which the content of antithrombin in the blood is small. The effect of high temperatures (60° to 100° C.) in weakening or destroying the action of antithrombin is accelerated greatly by the presence of small amounts of neutral salts (NaCl).

Sadikoff and Lozinsky<sup>4</sup> have made a study of the changes brought

<sup>1</sup> Munch med. Woch., July 28, 1911.

<sup>2</sup> American Journal of Physiology, November, 1914, xxxv, 4.

<sup>3</sup> Ibid., December, 1914.

<sup>4</sup> Russk. Vrach., St. Petersburg, 1914, xiii, 19.

about by the influence of water, salt solution, etc., in the viscosity of the blood in man, rabbits, sheep, guinea-pigs, cats, and pigeons. Rabbit blood, weakened with normal salt solution, does not show any changes in the viscosity, but, when diluted with two parts of plain water, the viscosity becomes greater. In pigeon blood the plasma also shows greater viscosity when weakened with an equal volume of water. The same occurs in man; solutions of human blood with ten parts water, ammonia, or normal salt solution, give an increased blood viscosity, but saturated ammonia solution increases viscosity less than plain water. The plasma also shows greater viscosity with an isotonic normal salt solution. Hence, normal salt solution is by no means an indifferent medium for the red blood cells, because it increases the viscosity of the blood and causes swelling of the red blood corpuscles, even in weak solutions. Therefore, red blood cells washed with large quantities of normal salt solution such as are used for hemolysis experiments, are not normal cells, but artificial products. As the plasma and serum also show viscosity changes, it follows that the albuminoid substances in the plasma must go through ultramicroscopic changes at least, which changes probably play a part in the phenomena of immunization.

Pepper and Krumbharr<sup>1</sup> state that of seven dogs developing marked anaphylactic shock, all showed a delay in, or absence of, coagulation of the blood. In all of these, the addition of calcium and thromboplastin solution to the oxalated plasma restored its coagulability much more efficiently than calcium alone, or calcium plus fibrinogen solution. No noteworthy change was observed in the fibrinogen content of the blood in this group. The authors believe that such results point to a decrease of thromboplastin, or an excess of antithrombin, as the important feature responsible for the loss of power of coagulation in anaphylactic shock. Five dogs with slight, or no, shock, showed no changes in the coagulability of the blood, except that, in four, the freshly prepared oxalated plasma (1 : 10) clotted spontaneously. In no case was clotting observed in richer proportions of oxalate (1 : 15). The supposition that this coagulation in the presence of oxalate might be due to an excess of calcium in the blood was shown by the result of quantitative calcium determination to be untenable. The only plausible explanation, in the author's opinion, is that suggested by the work of MacRae and Schnack, that is, that some thromboplastic substance, as kephalin, may be present, and, in the absence of an excess of oxalate, is responsible for the clotting of the plasma.

In an investigation of the factors affecting the coagulation time of the blood, Cannon and Gray<sup>2</sup> found that epinephrin injected intravenously in small doses (0.001 mg. per kilo), and in larger doses subcutane-

<sup>1</sup> *Journal of Infectious Diseases*, May, 1914.

<sup>2</sup> *American Journal of Physiology*, May, 1914.

ously, will shorten coagulation time to one-half or one-third the former duration. The prompt shortening of the process after small doses is changed after larger doses (about 0.03 mg. per kilo) to a lengthening, and later a shortening, or to a lengthening alone. The effect of epinephrin on the clotting time is not associated with any corresponding effect on arterial pressure. If the blood is confined anterior to the diaphragm, or if the intestines and liver are removed, epinephrin in small doses does not cause rapid clotting. The addition of a small amount of epinephrin to drawn blood does not hasten clotting. Increase of dextrose in the blood to 0.3 or 0.4 per cent. does not cause the rapid clotting seen after epinephrin injection. The explanation is suggested that epinephrin accelerates the clotting process by stimulating the liver (and intestines?) to greater activity in discharging some factor or factors in coagulation.

Stimulation of the splanchnic nerve, Cannon and Mendenhall<sup>1</sup> found results immediately or after a brief delay, in shortening of the coagulation time of blood. The degree and the duration of the effect varies. Clotting not uncommonly takes less than half the time it took before stimulation, and this period of rapid clotting may last from ten to thirty minutes. The stimulation usually produces less marked effects as it is repeated. If the adrenal is removed on one side, splanchnic stimulation on that side does not shorten the clotting time; whereas splanchnic stimulation on the other side is still effective. The faster clotting is therefore due to increased adrenal discharge. Since stimulation of nerves supplying the liver and intestines does not hasten clotting, and since increase of epinephrin has no effect in the absence of the liver and intestines, the shortened clotting time after splanchnic stimulation is accounted for by the action of adrenal discharge on the liver (and intestines?) The variations in the effects in different animals can be accounted for by variations in the epinephrin content of the adrenal glands in confined animals.

Stimulation of the afferent nerves (sciatic, crural) or major operations under light anesthesia were found by the same authors<sup>2</sup> to markedly shorten the coagulation time of the blood. Emotional excitement is the occasion for very rapid clotting (sometimes in less than a half minute) which becomes very slow (three to five minutes) when the splanchnic nerves are cut. Pain and strong emotions have been proved to evoke secretion of the adrenal glands; and epinephrin hastens clotting. Rapid coagulation may reasonably be considered, therefore, as another instance of an adaptive reaction serviceable to the organism in the injury which may accompany pain, or which may follow the struggle that fear or rage may occasion.

Howell<sup>3</sup> has devised methods for ascertaining the relative amounts of

<sup>1</sup> American Journal of Physiology, May, 1914, xxxiv.

<sup>2</sup> Ibid.

<sup>3</sup> Archives of Internal Medicine, January, 1914.



prothrombin and antithrombin in the blood. With the use of these methods he has found that in hemophilia the blood is deficient in prothrombin. The antithrombin may be normal or somewhat greater than normal. The characteristic peculiarity of hemophilic blood is its markedly delayed time of coagulation. This peculiarity is explained by the diminution in amount of the prothrombin, which results in a relative excess of antithrombin. The detection of a hemophilic condition of the blood is facilitated by first oxalating the blood and then recalcifying with an optimum amount of calcium. Under these conditions the time of clotting exhibited by normal plasma is very constant (nine to twelve minutes). That of hemophilic blood is greatly delayed.

In patients suffering from spontaneous thrombosis of the veins, Howell found evidence of a diminution in the antithrombin of the blood, the prothrombin being normal. It is suggested that this deficiency in antithrombin operates as a favoring, perhaps as a determining, factor in the production of the thrombus. In purpura hemorrhagica and other forms of so-called purpura, no evidence was found of any variation from normal in either the antithrombin or the prothrombin.

Weil and McMeans<sup>1</sup> have studied a case of a progressively severe bacteriemia in which cultures of the *bacillus lactis aërogenes* were obtained during life from the blood, urine, and prostatic secretion. Purpura, although a late manifestation, was the result of this infection. On account of the systemic reactions after each surgical interference (passing sounds), in the urethra, the authors feel convinced that this was the point of entrance of the infection into the blood-stream. The authors suggest that probably infection of the genito-urinary tract by bacteria of the mucosus group is more common than is realized.

Bradburn<sup>2</sup> reports a case of oral sepsis which simulated Henoch's purpura. The patient, a man, aged twenty-eight years, was taken acutely with purpuric skin lesions, pains in the bones, attacks of colic, bloody mucous diarrhea, hematuria, and high fever. Under treatment in the hospital, the condition showed no improvement. On examination for a septic focus, his mouth was found to be full of septic and carious stumps. All of these were removed under an anesthetic, and from that day his symptoms disappeared and he left the hospital practically well. In a few weeks he was back at work and has remained well ever since.

**TREATMENT.** Little of moment has appeared in the literature of the past year on the treatment of hemorrhagic disease. Lespinasse<sup>3</sup> has written on the treatment of hemorrhagic disease of the newborn by *direct transfusion of blood*. He tabulates 15 cases, in all of which success from transfusion was obtained. In the treatment of hemorrhage of the newborn, there are three indications: (1) the hemorrhage should be

<sup>1</sup> Journal of Infectious Diseases, July, 1914.

<sup>2</sup> British Medical Journal, March 7, 1914.

<sup>3</sup> Journal of American Medical Association, June 13, 1914.

stopped; (2) the lost blood should be replaced; (3) the infection should be overcome. Transfusion of live, non-clotted blood meets all these indications in an ideal manner. Transfusion stops the bleeding at once, replaces the blood lost, and gives the baby fresh complement and antibodies to aid it in overcoming any infection that may be present. Some of these cases are due to asphyxia and consequent fatty degenerations. During the progress of the transfusion, the child's color gradually becomes pink, then red, first on the lips and ears; then little pink spots are scattered diffusely over the body, and, finally, after the baby is filled with blood, may become as red as an ordinary scarlet-fever patient. The hemorrhages from the various lesions cease as if they had been clamped with artery forceps; by the time the transfusion is completed, the lesions are absolutely dry. Simultaneously with the color-changes in the skin, there is a great improvement in the baby's general condition. In my series of cases there have been no deaths from hemorrhage. Two patients died of syphilis, one five days and the other nine days after transfusion. My cases varied in severity from one in which the patient was practically brought back to life, to others in which there was less immediate danger.

In hemorrhage of the newborn the patients are not hemophiliacs; they are not bleeders in after-life at all. All sorts of operations have been performed on these babies from one week to several months after the bleeding has ceased, and there has been no extraordinary hemorrhage. These children grow and become normal, healthy persons. Rapidity of transfusion should be considered carefully; if the blood is allowed to enter the vascular system of the baby too rapidly, there will be a temporary dilatation of the heart, and the baby will become blue about the face and on the feet and hands. When this occurs, the blood-flow should be stopped until the red color returns. The father was the donor in ten cases, the mother's half-sister in one, and a non-relative in three. The bloodvessels used were the radial artery in seven cases and a forearm vein in seven cases on the donor; on the baby, the femoral vein was used in four instances and the jugular in ten. The duration of the transfusion varied from five to fifteen minutes. In the case that took fifteen minutes, Case 11, the father fainted, reducing his blood-pressure so low that it took longer to fill the baby with blood.

### THE THYROID GLAND.

The writings of the year on the thyroid gland have, as usual, been voluminous. A large amount of experimental work has been carried out, and considerable attention has been paid to the relation of this structure to other ductless glands, and to the effects of infections and toxemias on its functions.

**Experimental Researches.** Drinker and Drinker<sup>1</sup> have studied THE EFFECTS OF EXTRACTS OF SHEEP'S THYROID AND OF PATHOLOGIC HUMAN THYROID ON THE FATIGUE CURVE OF VOLUNTARY MUSCLE. They macerated desiccated sheep's thyroid containing 0.2 per cent. of iodine in Ringer's solution isotonic for the frog, and the filtrate from this contained the substance used in the experiments. By such a method only a small amount of the original material is represented in the filtrate, as the dried gland is but slightly soluble. The authors term filtrations which resulted from the use of 5 gm. of dried thyroid per 100 c.c. of Ringer's solution, 5 per cent. solutions; those which before filtration contained 1 gm., 1 per cent. solutions, and so on throughout the entire series. They found that Ringer's solution extracts of dried sheep's thyroid caused depression in 3 per cent. solutions. The depression gave way to slight stimulation between 1 and 2 per cent. of strength. At 1 per cent. there was usually no effect distinguishable from pure Ringer's solution. Similar material from cases of Graves' disease gave no equal amount of depression. Clinical observation on myasthenia gravis and exophthalmic goitre is suggestive in this relation. In addition, there was irregularity in the strength of contractions, but the series is much too small to call this a specific attribute. Extracts from cases of colloid goitre gave, in most cases, no depression; and, in all, less depression than was obtained with either the sheeps' thyroid or with extracts of parenchymatous goitres. There is no irregularity in the strength of contractions, such as was noticed with the latter type.

Fenger<sup>2</sup> has carried out experiments with the idea of determining the influence of pregnancy and castration on the iodine and phosphorus metabolism of the thyroid gland. He found that while female animals contain more thyroid tissue and iodine in thyroid combination per unit of body weight than male animals, there is no apparent difference in size and physiologic activity between glands from pregnant and non-pregnant female animals, and the increased iodine metabolism of the fetal glands, both male and female, seems therefore to be independent of the maternal glands, having in common only the source of the iodine. Castrated males contain less thyroid tissue than either uncastrated males or females, but the iodine content per unit of body weight, is about half way between the uncastrated male and female animals. The phosphorus content of the thyroid seems to be fairly uniform in all four cases, and should only be considered an indication of normal physiologic activity. The garlic-like odor observed in all four lots of glands is due directly to the comparatively large amounts of iodine present, and furnishes evidence of a chemical reaction specific to the thyroid and resulting in an organic complex possessing the characteristic odor of oxidizing phosphorus. The odor was observed before the

<sup>1</sup> American Journal of Medical Sciences, July, 1914.

<sup>2</sup> Journal of Biological Chemistry, February, 1914.



death of the animals, indicating that the reaction actually takes place during life.

Hunnicutt's experiments<sup>1</sup> show that three-fourths of the dog's thyroid gland may be removed without appreciably affecting the remainder of the gland. In only 3, of the 59 dogs on which the operation of piecemeal removal was performed, did the remaining gland change from a normal to a hyperplastic state. In 5, of the 59 dogs, the remaining gland reverted from the early hyperplastic state to the normal state. Where a diagnosis of some degree of hyperplasia was made at the first operation, the pieces removed from the same dogs at subsequent operations had not undergone further hyperplasia. Of the pieces removed from 56 dogs at the first operation, 58 per cent. were normal, 32 per cent. showed early glandular hyperplasia, 5 per cent. marked glandular hyperplasia, and 5 per cent. very early glandular hyperplasia. Definite increase in the size of the remaining gland (hypertrophy) was not observed. The remains of the thyroid lobes, the accessory thyroids, and the successful grafts in a given dog, presented the same histologic picture. In no dog was myxedema or tetany observed in which as much as one-fourth of the thyroid and one parathyroid gland was preserved.

In discussing thyroid grafts, Paschoud<sup>2</sup> is led to conclude, from his own work, that thyroid tissue seems to be particularly favorable for engrafting; it frequently lives, grows and functionates, and this method of treating myxedema and cachexia strumipriva is of value. No benefit is known to date to result from thyroid grafts in tetany and cretinism. Paschoud remarks that he has been unable to find in all the literature even one case in which the remote results were favorable enough to justify the assumption of any real efficacy from the thyroid-grafting operation in these conditions. He relates the case of a woman who had a tumor develop in the region years after the removal of a parenchymatous goitre. It was removed at the sixth year. Again a tumor developed in the region, this time in the scar, and this tumor was removed eight years after the second. Each of the tumors had all the characteristics of thyroid tissue, and he is convinced that each developed from an engrafted scrap of the thyroid during the preceding operation.

Smith<sup>3</sup> has found that the administration of potassium iodid to a guinea-pig in which a piece of its own thyroid gland has been transplanted does not seem to have any marked effect on the behavior of the graft. He did not find atrophy of the grafts, as reported by Cristiani, after the use of thyroid tablets. However, thyroid grafts show early central necrosis. The peripheral acini only remain intact. Regeneration takes place by the growth of thyroid tissue from the peripheral acini toward the centre.

<sup>1</sup> American Journal of the Medical Sciences, August, 1914, cxlviii, No. 2.

<sup>2</sup> Lyon Chirurgical, December, 1914.

<sup>3</sup> Journal of Medical Research, May, 1914.

Marine<sup>1</sup> concludes, from his observations and experiments on goitre in brook trout, that this disease in fish is a non-infectious, non-contagious symptomatic manifestation of a fault of nutrition, the exact biochemical nature of which has not been determined. Feeding the highly artificial and incomplete diet of the liver is the major etiologic factor in bringing about this fault of nutrition which is at once corrected by feeding whole sea fish. Water plays no essential part in the etiology, transmission or distribution of the disease in the fish of this hatchery.

From a study of the rate of disappearance of ammonia from the blood in normal and in thyroidectomized animals, Jacobson<sup>2</sup> has found that even with the kidneys excluded from the circulation, ammonia injected into the blood is so rapidly removed from the blood that only a very slight excess is present five minutes after the injection. There is only a very slight difference between the normal and parathyroidectomized animal in the rate of disappearance of the ammonia from the blood. The method employed is not adequate for the determination of liver efficiency (ammonia-destroying power), because the rate of disappearance of excess of ammonia from the blood, independent of the liver function, is so great as to render the actual ammonia destruction by the liver almost a negligible factor.

PATHOGENESIS. Pletneff,<sup>3</sup> in a study of 9 cases of infectious diseases, 2 of typhoid, 2 of sore throat and 5 of influenza, in which the thyroid gland became involved, found clinical signs and symptoms of exophthalmic goitre, such as tachycardia, tremor, goitre, Graefe, Moebius, and Stelwag signs, etc. The toxemic conditions apparently involved not only the thyroid but other glands with an internal secretion, producing a polyglandular affection.

Clark<sup>4</sup> has reported an interesting case of *typical exophthalmic goitre* which occurred in a woman, aged twenty-four years, and which was doubtless a late clinical *manifestation of hereditary syphilis*. The clinical symptoms and the syndrome had grown steadily worse until the patient had fallen into a drowsy and almost comatose condition, with a pulse of over 200 beats per minute. The sphincters were quite paralyzed and there was continuous vomiting lasting for a fortnight. The patient had a history of having had epileptiform fits when twelve years of age. On applying the Wassermann reaction it was found to be strongly positive, and the same test applied to the patient's mother also proved strongly positive. Antisyphilitic treatment was employed, and after eight days the pulse rate had subsided to 150. The goitre was sensibly smaller, but there was little improvement in the exophthalmos. After thirty injections the patient became much better, both in regard to

<sup>1</sup> Journal of Experimental Medicine, January, 1914, vol. xix.

<sup>2</sup> Journal of Biological Chemistry, July, 1914.

<sup>3</sup> Russky Vrach., February 15, 1914.

<sup>4</sup> Journal of American Medical Association, April 11, 1914.

hyperthyroidic manifestations and the general health. The following month she was given two injections of salvarsan and by the third month she had recovered. Neither the goitre nor the exophthalmos could be detected, the pulse registered 75, and the nervousness had disappeared. In this case the possibility of contagion was absolutely ruled out; the patient had never had any clinical sign of infection, but on the other hand had presented skeletal stigmata.

**PATHOLOGY.** Farrant<sup>1</sup> has made an exhaustive study of the pathological changes of the thyroid in disease. This paper records observations on 85 cases of goitre (exclusive of simple hyperthyroidism) between 1909 and 1914, as to the relationship between toxemias and diseases of the thyroid. He endeavors to prove that in cases in which the thyroid is diseased the microörganism responsible for the toxemia must be determined, and to show that in this way not only can disease of the thyroid be cured, but also prevented. Endemic goitre, according to Farrant, is caused by the toxins from the typical forms of *B. coli*. The mutants are usually conveyed by water. They become indigenous in the intestine, and different mutants of *B. coli* are to be found in the feces of cases of endemic goitre. The mutants are but rarely present in the feces of normal individuals or in the feces of individuals goitrous from other causes. It is possible to conceive circumstances which place the *B. coli* under abnormal conditions in the intestine itself, and lead to mutation and the temporary appearance of mutants in the feces of normal individuals. The mutants set up an apyrexial toxemia, which stimulates the thyroid, so leading to a colloid hyperplasia and eventually to enlargement of the gland. The whole process can be imitated in the laboratory, and endemic goitre induced in guinea-pigs by feeding with small doses of the mutants.

The supervention of a fresh toxemia while the gland is in a hyperactive state causes a complete hyperplasia, with absorption of colloid and signs of hyperthyroidism up to a condition of exophthalmic goitre. This is dependent on the intensity and duration of the fresh toxemia. Endemic goitre is preventable by the avoidance of water contamination and by the sterilization of contaminated water. It can be cured by the administration of intestinal antiseptics, the gland returns to normal, providing no degeneration has taken place. The gland as a whole involutes to normal, but the adenomata or cysts are left. A condition similar to endemic goitre can be caused by other toxemias capable of inducing a colloid hyperplasia.

Exophthalmic goitre, Farrant claims, is due to a combination of toxemias of an intensity sufficient to cause a hyperplasia with absorption of the colloid material. One acts during a period sufficient to give rise to a complete hyperplasia associated perhaps with slightly marked



signs of hyperthyroidism without necessarily any glandular enlargement. The supervention of another infection stimulates the gland, which usually enlarges, and the signs of hyperthyroidism become very evident; the case develops into one of typical exophthalmic goitre. A nervous shock may lead to the diagnosis by suddenly bringing into evidence the symptoms of hyperthyroidism, especially those connected with the nervous system.

The severity and duration of exophthalmic goitre is dependent on the intensity and duration of the toxemias. If they be of short duration, the disease will disappear in a few months. Exophthalmic goitre can be prevented by the detection of the early cases of hyperthyroidism and the consequent removal of the basal toxemia. It can be cured if the causatory agents be removed before degeneration has occurred, either in the gland or in those organs that are affected by the hypersecretion.

When degeneration has taken place in the thyroid, removal of the toxemias causes involution to take place only in the hypertrophied portion; the adenomata and cysts are left. These require appropriate surgical treatment, as they to a certain extent keep up the symptoms of thyroid excess. Surgical treatment without removal of the cause is followed by recurrence unless so much of the gland substance has been removed that hypersecretion is impossible. Degeneration in the other organs partially recovers after involution of the thyroid; appropriate treatment is necessary for those that remain. Acute cases of exophthalmic goitre may present themselves in which surgical treatment is the only means of saving them, though the risk of death under the anesthetic perhaps precludes operation.

Wilson<sup>1</sup> studied 431 thyroids removed from cases of true exophthalmic goitre, 373 thyroids removed from as many cases of non-toxic (*i. e.*, simple) goitre, and 129 thyroids removed from toxic-non-exophthalmic cases with symptoms closely approaching the picture of Grave's disease. One hundred and fifty-five thyroids removed from toxic-non-exophthalmic cases in which the clinical picture closely resembles, and, in many instances, cannot be differentiated from, the cardiovascular complex resulting from alcoholic, luetic, septic and other well-known toxins, and thyroids from 90 cases similar to the last, but of more mild or doubtful toxicity. He arrived at the following conclusions: The pathology of the thyroid in true exophthalmic goitre is essentially a primary parenchymatous hypertrophy and hyperplasia, *i. e.*, an increased amount of functioning parenchyma associated with an increased absorption. The process is an acute one. The pathology of atoxic simple goitre is marked essentially by atrophic parenchyma, decreased function, and decreased absorption. The process is a chronic

<sup>1</sup> American Journal of the Medical Sciences, March, 1914.

one. The pathology of toxic-non-exophthalmic goitre (*i. e.*, those resembling exophthalmic goitre) is one of increased parenchyma through regenerative processes in atrophic parenchyma or the formation of new parenchyma of the fetal type, with an increase in each instance of secretory activity and of absorption. The process is a chronic one, but sufficiently active to cause the patient to consult a surgeon earlier than do those cases in clinical Group 1. The nearer the cases (toxic-non-exophthalmics) approach, in age and symptoms, true exophthalmic goitre, the shorter the duration of the period of goitre before operation, and the smaller the average weight of the gland at the time of its removal.

The cases of toxic goitre of clinical Group 1 (*i. e.*, those in which the symptoms are of the cardiovascular variety) much more closely resemble cases of simple goitre in their pathology in all respects than do the cases of clinical Group 2. A large number of them are of the colloid-goitre type, the enlargement of the thyroid has existed for a longer period before operation, and the portion of the gland removed is materially larger than in those cases of clinical Group 2. Finally, it is stated that all the above pathologic evidence points to a constant relative association of increased secretion and increased absorption from the thyroid, proportional to the degree of toxicity on the part of the patient. We have as yet no absolute proof that such secretion and absorption are the cause of, rather than coördinate with, the symptoms, but the presented evidence strongly points to that conclusion.

Cameron<sup>1</sup> found that iodine was present in the thyroids of the pigeon, alligator and frog, in amounts corresponding with the diets of these animals. It is also present in the thyroid of the dogfish. He believes that further support is therefore given to the theory that it is an invariable constituent of thyroid tissue. Iodine is absent from the ventral branchial body of the frog. The amount of iodine present in the parathyroids of the dogs is of a less order of magnitude than that in the corresponding thyroids, if, indeed, the actual quantity observed be not wholly attributable to thyroid contamination. Cameron's results indicate a differentiation of function between the thyroid and parathyroid.

Grummae<sup>2</sup> argues that a lack of metabolized iodine is the cause of myxedema, while exophthalmic goitre is the result of an excess of non-metabolized iodine. In other words, the primary cause of myxedema is a deficiency of iodine in the food, while the cause of exophthalmic goitre is a functionally weak thyroid, with a sufficiency or an excess of iodine in the food. Experience has already demonstrated that cretinism, myxedema and endemic goitre are favorably influenced by administration of organic thyroid-iodine, or thyroid extract. On the other hand, iodine in any form, organic or inorganic, or food containing iodine, is

<sup>1</sup> Journal of Biological Chemistry, January, 1914.

Berl. klin. Woch., April 20, 1914, li 16.

distinctly injurious in exophthalmic goitre and also in ordinary goitre, not of the endemia type, but which is often a preliminary phase of exophthalmic goitre. Endemic goitre can thus be effectively treated with iodine, but it is strictly contra-indicated in the sporadic form.

ASSOCIATION OF THE THYROID WITH OTHER DUCTLESS GLANDS, ESPECIALLY THE THYMUS. Hart<sup>1</sup> calls attention to the fact that in 1907 he reported a case of exophthalmic goitre in which the thymus was apparently the determining factor. This was the first time that attention had been called to such a condition. The case was that of a man aged twenty-nine years, who had the typical signs and symptoms of exophthalmic goitre. He died suddenly and the thyroid was found to be apparently normal in every respect, while the thymus was abnormally large, and portions of it transplanted into guinea-pigs proved to be extremely toxic. The controls of this case bore transplants of thymus of other origins without harm. Hart thinks it is now established beyond question that exophthalmic goitre can develop from an exclusively thyroid origin, from an exclusively thymus origin, and from a mixture of both. The predominance of the thymus factor seems particularly deleterious, and the more so, the greater the tendency to constitutional hypoplasia. The earlier the disease develops, the greater the preponderance of the constitutional element. The defective development of the chromaffine system, especially the medulla of the adrenals, is one of the chief signs of the constitutional hypoplasia, particularly from the functional standpoint.

Many cases of Addison's disease, he adds, develop on the basis of defective development of the adrenals—a manifestation of constitutional hypoplasia. He found extreme hypoplasia of the chromaffine system in a number of persons who had died during, or soon after, operative treatment of exophthalmic goitre. In one such case exophthalmic goitre and Addison's disease had both developed on the basis of physical inferiority. Neither disease was secondary to the other. In another case there was slight bronzing and merely hints of exophthalmic goitre, but the defective functioning of the chromaffine system had entailed death without the typical symptoms having had a chance to develop. In other cases the chromaffine system was in actual hyperplasia, showing the excessive functional demands on it; we must not forget that a hyperplastic organ is liable to be functioning abnormally as well as a hypoplastic one. In operative treatment of exophthalmic goitre, the author says that the thymus should be first attacked. Resection of the thyroid should follow its total or partial removal.

Kocher,<sup>2</sup> in spite of the report of Hart's case, insists that no instance of Basedow's disease is yet known in which at necropsy or operation the thyroid was found free from hyperplasia, but the thymus is often appar-

<sup>1</sup> Arch. f. klin. Chirurgie, 1914, civ, No. 2.

<sup>2</sup> Ibid., cv, No. 4.



ently normal. In nearly 50 per cent. of all cases of Basedow's disease, a tendency to tardy hyperplasia or tardy involution of the thymus is evident. Hyperplasia of the thymus is more frequent in younger Basedow patients. No special histologic findings were discovered in the thymus at the necropsy of 14 cases with Basedow's disease; 6 had died under operative treatment and 8 from the Basedow alone. When there is hyperplasia of the thymus, the patient might be prepared for an operation on the thyroid by a course of thymus extract and Röntgen exposures of the thymus, just before the operation on the thyroid.

Pettavel<sup>1</sup> reports from Kocher's clinic that 80 per cent. of the patients who have died in connection with the operation for exophthalmic goitre have had an abnormally large thymus, and that this was likewise true in 66.6 per cent. of those who succumbed to mild intercurrent disease. Thus, the thymus was normal in only 25 per cent. of cases of exophthalmic goitre.

Simmonds<sup>2</sup> figures agree with those of Pettavel. He says that we have to reckon with an abnormal thymus in 75 per cent. of all cases of exophthalmic goitre.

Matti<sup>3</sup> states that the changes in the thymus in exophthalmic goitre are not compensatory to the thyroid changes, but are directly coordinated with, and parallel to, the changes in the thyroid.

Halsted<sup>4</sup> declares that, from postmortem examination of cases of exophthalmic goitre which have died of intercurrent disease, it has been found that the thymus gland is persistent in about 82 per cent. of them, and that, in those cases which have died of heart failure after operation, enlargement of the thymus has been found in about 95 per cent. From facts gleaned at the autopsy table, from animal experiments, and from results following primary thyroidectomy, Halsted is convinced that the thymus gland may play an important role in exophthalmic goitre and in some cases may assume the title role. Some of the most puzzling features of the disease are made possible of interpretation by the discovery of the influence which the thymus may exert.

Von Graff and Novak,<sup>5</sup> in a discussion of the relation of exophthalmic goitre to the genital sphere, state that the disturbances in the genital sphere with exophthalmic goitre are too common to be merely casual. The onset of Basedow's disease, further, is liable to coincide with puberty, pregnancy, or the menopause. It seems probable that in certain cases the genital anomaly is the first to develop, and this starts up the exophthalmic goitre by its influence on the thyroid or on the sympathetic nervous system. The opposite is also known to occur, and exophthalmic goitre may thus be primarily thyrogenous, neurogenous or ovarigenous.

<sup>1</sup> Mitteilungen a. d. Grenzgebieten der Med. u. Chir., 1914, xxvii, No. 4.

<sup>2</sup> Zentralbl. f. Chirurgie, March 21, 1914.

<sup>3</sup> Berlin. klin. Woch., July 20, 1914.

<sup>4</sup> Bulletin of Johns Hopkins Hospital, August, 1914.

<sup>5</sup> Arch. f. Gynäkologie, 1914, cii, No. 1.

**SYMPTOMS.** In discussing *diarrhea of thyroid origin*, Curschmann<sup>1</sup> says that surgeons encounter diarrhea in nearly 50 per cent. of their exophthalmic goitre cases because they see only those cases which are advanced, and diarrhea is frequent in these cases and adds to the gravity of the prognosis. He cites the case of a woman, aged forty-three years, who had severe diarrhea in the mornings for six months, rebellious to all measures and entailing menacing debility. Except for some enlargement of the thyroid since the age of sixteen years, she had always been healthy. Curschmann suspected thyroid intoxication and obtained a positive response to the Loewi test, that is, mydriasis on instillation of epinephrin in the eye. The blood showed also positive lymphocytosis which Kocher regards as pathognomonic for Basedow's disease. Upon these findings, and these alone, Curschmann resected the thyroid, and at once the diarrhea was cured and the patient promptly recovered, regaining full earning capacity in less than two months. There had been no other signs of exophthalmic goitre at any time. The diarrhea came on always in the morning, directly after waking. In conclusion, he warns that a thyroid origin should be suspected in all cases of obstinate "nervous" diarrhea even without any other indications of thyroid disturbance.

Moller<sup>2</sup> has studied *the gastric secretions* in 24 cases of *exophthalmic goitre*. He found achylia constant in all cases of the pronounced classic type, and the gastric condition was marked from the very beginning of the disease. If even only one of the classic triad of symptoms was absent, the secretion of hydrochloric acid apparently was not modified. Wolpe's studies led him to believe that the achylia was due to the toxic action of the thyroid poison on the gastric nerve, but Moller believes that the evidence favors the assumption of a chronic gastritis as much as that of a nervous achylia. He cites the case of a woman who had had stomach trouble for five or six years. She entered the hospital complaining of digestive disturbances, vomiting, and diarrhea. Achylia was present. There were no signs of exophthalmic goitre, but, during the month she was in the hospital, symptoms of Basedow's disease developed.

Maranôn,<sup>3</sup> on the other hand, finds that hyperchlorhydria is frequently found associated with symptoms indicating excessive functioning of the thyroid gland. This hypersecretion usually occurs in what he terms vagotonic cases or the milder degrees of hyperthyroidism which do not show the classical symptoms of exophthalmic goitre. He feels that the excessive secretion of gastric juice is caused through stimulation of the gastric nerve by the thyroid secretion. In many cases diagnosed as gastric neuroses, the author believes there is a latent hyperthyroidism present.

<sup>1</sup> Arch. f. Verdauungskrankheiten, February, 1914.

<sup>2</sup> Hospitalstidende, January 28, 1914.

<sup>3</sup> Revue de Médecine, March, 1914.

**TREATMENT OF HYPERTHYROIDISM.** During the past year *Röntgen therapy* for this condition has received the major portion of attention in the literature, which has not been very extensive.

Sielmann<sup>1</sup> has treated 21 cases of Basedow's disease by systematic Röntgen exposures during the last five years. The total duration of treatment was from six weeks to six months, and he never allowed the exposures to reach the point of inducing a dermatitis. His experience was so favorable that he urges this as the routine method of treatment after failure of medical measures. If this fails, then an operation should be considered. It may prove useful likewise to supplement operative treatment, if this does not realize a complete cure. Only one of his patients failed to show benefit from the Röntgen treatment and required an operation.

In 20 cases of exophthalmic goitre, Sinozersky<sup>2</sup> has studied the relation of the thymus gland to this condition. In some of these cases the thymus was treated by the Röntgen rays after two or three of the thyroid vessels had been ligated, but, in the majority of cases, the Röntgen treatment of the thymus was carried out before any operative measure had been resorted to. The condition of the thymus gland was estimated by dulness on percussion over the sternum and to the left, after a tumor or aneurysm had been excluded by röntgenoscopy, showing a shadow moving up and down the aorta during respiration, and by the blood examination—increased numbers of lymphocytes (55 per cent.) and reduced polynuclears. Preliminary experiments on young dogs and rabbits showed that exposures to the Röntgen rays cause atrophy of the thymus. Röntgen treatment of Basedow's disease, directed against the thymus, with exposures every three or four days, gave marked improvement after five or six sittings. The pulse fell to 80 from 120 or 140; the goitre, the sweating, nervousness and exophthalmos decreased, and the blood showed a decrease in the number of lymphocytes and increase of the polynuclears. As the skin in Basedow's disease is very sensitive to the Röntgen rays, an interval of three weeks is necessary before entering on another series of exposures. His conclusions are that the role of the thymus gland in the pathogenesis of exophthalmic goitre is established now beyond question.

Ludin<sup>3</sup> has studied the literature with particular reference to the effect of Röntgen treatment on goitre. The general verdict with simple goitre seems to be that a cautious trial of the Röntgen rays seems justified in cases of growing parenchymatous struma in the young. Under other conditions it is indicated only when operative treatment is contra-indicated or refused. Röntgen treatment has more of a field with exophthalmic goitre, and experience is accumulating to the effect that

<sup>1</sup> Münch. med. Woch., October 27, 1914.

<sup>2</sup> Russk. Vrach., July 4, 1914.

<sup>3</sup> Centralblatt f. d. Grenzgebiete d. Med. u. Chir., Jena, 1914, xv. 3, No. 3.



it has a favorable action on the Basedow goitre in numerous cases. The nervous disturbances and the impairment of the general health are what respond most favorably to Röntgen treatment. Next in order the tachycardia is influenced, but more slowly, and the pulse may grow slower in time. Forty-two report that in time the protruding eyes receded entirely in 6; almost completely in 2; very slight protrusion was left in 9; in 14 there was very little change, and none at all in 11. Subsidence of every symptom is rare. The required duration of the treatment is variable. A few instances have been published of a return of symptoms after radiotherapy; more numerous are the reports of durable cures, from one to four years.

Rogers,<sup>1</sup> in a discussion of the course of acquired disease of the thyroid gland and the principles which control its progress, states that he has observed 62 patients who applied for relief after one or more partial thyroidectomies. Only the minority had failed to show any benefit, and a considerable part of this minority stated that they were worse than before the operation. An analysis of all these cases, however, has failed to yield any definite rules for avoiding poor results. Thirty-eight, for example, showed the presence of exophthalmos, and 24 did not, though some of them said it was present formerly. Tachycardia was present and had not been relieved in 35. Eight of these were later subjected to more extensive thyroidectomy, and 5 were thus cured of their rapid heart action. If enough of the gland is ultimately removed, or removed in successive stages, the pulse rate can evidently be reduced, but it probably cannot be reduced by removing more than two-thirds of the gland at once. The worst results in these 62 cases seemed to have occurred in subjects who were operated on before they had attained their maximum growth and development; that is, before the age of twenty-five, and in those who had small goitres.

All of the 62 patients complained of a greater or less amount of asthenia, or inability to expend the normal amount of mental and physical energy, and a considerable majority showed a blood-pressure above 140 mm. of mercury, and it is noticeable that the few Rogers has been able to follow have from year to year shown a more or less steady increase in their blood-pressure. A large proportion of these cases have shown some signs which he interprets as those of hypothyroidism, although many, in conjunction with the hypothyroidism, have presented a more or less constant tachycardia. With the exception of the few successful, or partially successful, secondary thyroidectomies, the only treatment which Rogers has found beneficial in these cases has been rest in combination with organotherapy. The most frequently useful agent, especially for those with high blood-pressure, has been the adrenal proteins which contain no adrenalin. The pituitary, the

<sup>1</sup> *Annals of Surgery*, September, 1914.

thymus or the pancreas has seemed indispensable for the relief of others. The indications for the particular organ have been ascertained by experiment in each case. A few seemed most relieved by a combination of thyroid with some other organ feeding. The impressions derived from these experiences are summed up as follows: That partial thyroidectomy is to be especially avoided in patients who have not completed or have just completed their growth and development; that it is to be avoided in symmetrically enlarged thyroids, as these seem peculiarly prone to relapse even after a considerable period; that it is to be avoided in subjects of the very "nervous" type; that patients with marked exophthalmos of long duration bear any operation badly and can seldom be more than moderately improved.

In considering the *indications calling for surgical treatment in exophthalmic goitre*, Petren<sup>1</sup> concludes that the criterion for guidance is the cardiac symptoms. No other of the cardinal symptoms is sufficiently constant to base indications upon. The almost delirious heart action is a waste of energy and may give rise to permanent injury. The palpitation and the rest of the excessive action of the heart lead to a compensating hypertrophy and dilatation, and may finally wear out the heart from the overstimulation of the sympathetic from the hyperthyroidism. As this is the most serious element of the Basedow clinical picture, in his opinion, he bases upon it the decision of whether or not to operate. When the heart is already enlarged and does not subside under medical treatment, or the heart symptoms show no marked improvement, an operation should be undertaken. It may also be indicated if the mental or moral nature is changed. In the majority of cases the disease is mild and subsides more or less completely under medical measures. The patient should be kept systematically in bed. The latest reports on serum treatment, especially with milk from thyroidectomized goats, have not been encouraging, but Petren himself has had occasional good results from it. He has also obtained good results from carbonated baths and electricity to the nerves in the neck. The carbonated baths had an unmistakably soothing effect on the rapid heart action. Hot and cold baths might aggravate the condition.

Watson<sup>2</sup> reports 3 cases of *hypothyroidism* which he has *treated by injections of quinin and urea hydrochloride*. The patients had all been on medical treatment for from one to two years without improvement. In the first case the injection was used in conjunction with ligation of both superior thyroid arteries, but in the second and third cases the injection was the only treatment employed. Improvement seemed to be equally prompt without ligation, but whether or not the results will be as lasting as after ligation, the author says remains to be proved. In the first case 90 minims of a 1 per cent. solution of quinin and

<sup>1</sup> Hygiea, Stockholm, 1914, lxxvi, No. 18.

<sup>2</sup> Journal of American Medical Association, January 10, 1914.



urea hydrochloride were injected into the body of the right lobe, 60 minims into the left lobe, and the same quantity into the isthmus. In the second case 25 minims of a 4 per cent. quinin and urea hydrochloride solution were injected at four different points into the right lobe, and 30 minims were injected into the isthmus. In the third case 40 minims of a 2 per cent. solution were injected into each lobe and the isthmus. General improvement was more or less prompt and progressive in all three cases.

**Endemic Goitre and Cretinism.** ETIOLOGY. McCarrison<sup>1</sup> has carried out experiments on the etiology of endemic cretinism, congenital goitre, and congenital parathyroid disease. His results showed: (1) That out of sixteen animals born of goitrous mothers, which consumed fecal filtrate prior to and during pregnancy, three were born cretins, and the forty-seven animals born in cages showed no clinical or pathologic signs of this condition. (2) That of thirty-one animals, born of goitrous mothers which consumed fecal anërobes or the filtrate of a fecal emulsion, fifteen were found to have congenital parathyroid disease. Of these, two-thirds were born of mothers consuming the anërobic cultures, while one-third were born of a mother consuming a fecal filtrate which contained the toxic products of these anërobes. The parathyroids were normal in sixteen animals born of goitrous mothers in other cages. (3) Fecal organisms which grow aërobically on agar, while capable of causing marked hyperplasia of the thyroid gland, do not appear to be capable of producing any ill effect on the parathyroid glands.

Of the offspring of goitrous parents, a small percentage are born cretins; approximately 63 per cent. are born with congenital goitre, 32 per cent. are born with congenital parathyroid disease, and 33 per cent. are born with normal thyroid and parathyroid glands. McCarrison believes that cretinism and congenital goitre are due to the action of toxic substances derived from the intestines of the goitrous mother on the fetal thyroparathyroid mechanism. Cretinism represents the maximum, and comparatively rare, effect of these toxins; congenital goitre their minimum, and comparatively common effect. Between these extremes all degrees of thyroid involvement may occur, with or without associated swelling of the gland. Congenital parathyroid disease is due to the action on the fetal gland of the toxic products or organisms present in the intestine of the goitrous mother, which are capable of growth under anërobic conditions.

**METABOLISM.** An opportunity was given Greenwald<sup>2</sup> to study the metabolism in a cretin girl, and in this study he considered it advisable to pay particular attention to the distribution of nitrogen and sulphur in the urine. His results showed a few deviations from the normal; the absorption of nitrogen was poor; the ratio of ammonia nitrogen

<sup>1</sup> *Lancet*, March 21, 1914.

<sup>2</sup> *Archives of Internal Medicine*, September, 1914.



to total nitrogen was rather high. The creatinin output was very low, much less than in a case reported by McCrudden and a considerably greater amount of creatin was excreted. Aside from these observations, the findings seemed to be quite normal.

**SYMPTOMS OF ENDEMIC GOITRE.** Bigler<sup>1</sup> has studied in detail the cardiac changes in 100 cases of endemic goitre. 70 per cent. of these showed undoubted cardiac enlargement. Of the purely thyreotoxic symptoms, tremor was the most important and was found in 43 of the cases (10.29 per cent.). He found pure tachycardia in 7 cases (10.29 per cent.); tachycardia with arrhythmia in 16 cases (23.52 per cent.); tachycardia with dilatation in 19 cases (27.94 per cent.); tachycardia with arrhythmia and dilatation in 24 cases (35.29 per cent.); pure dilatation in 2 cases (2.94 per cent.). The principle symptom of the endemic goitrous heart, according to Bigler's findings, was tachycardia. This usually was moderate in degree, never reaching that grade exemplified by paroxysmal tachycardia. The arrhythmia found usually was an arrhythmia in the sense of a frequent change in the pulse rate and was entirely independent of the respiration and the age of the patient. The blood-pressure was, as a rule, subnormal or at the lower limit of normal. Infrequent findings noted by the author were a non-clear or impure split mitral sound, systolic murmurs over the mitral or pulmonary areas, extrasystolic arrhythmia and gallop rhythm.

Mamourian<sup>2</sup> reports the case of a typical cretin, four years of age, who was treated with thyroid extract for about three years without intermission. He came under Mamourian's care in January, 1910, and he continued the treatment for over six months, prescribing 20 grains of the dry extract per day. Neither his physical nor mental condition underwent any appreciable change. Mamourian then decided to try grafting. He had a sheep killed in the hospital while the patient was being anesthetized, removed the thyroid, placed it in hot saline and after incising it in several places planted it into the child's omentum, which was scarified with a needle. The patient made wonderful headway. Four years after the operation the boy has entirely lost his repulsive countenance, and looks pleasant and intelligent. He can read and write, tell the time and recognize coinage. He has grown to the extent of ten inches in four years. Since the operation he has very occasionally had a 5-grain tablet owing to a stutter which he develops at times, and which, according to the observation of the boy's mother, completely disappears when a small dose of extract is given.

Voronoff<sup>3</sup> has noted a marked improvement in a myxedematous boy, aged fourteen years, following a graft of monkey's thyroid. The patient had developed myxedema after an attack of measles at the age of

<sup>1</sup> Beiträge zur klin. Chir., 1914, lxxxi, No. 1.

<sup>2</sup> British Medical Journal, November, 14, 1914

Bulletin de l'Académie de méd., 1914, lxxviii, 26, 28.

eight years. The graft of the right lobe of the thyroid with its parathyroids was taken from a large monkey—a baboon—and implanted in the neck of the boy. It was embedded in a vascular region and was sutured closely to the surrounding tissues in order to promote adhesions and formation of new vessels. Voronoff states that during the six months since, the gradual improvement in both the physical and the mental condition has been striking. The boy had formerly been apathetic and stupid, the skin scaling off, the nose and lips enlarged; all this has retrogressed and the features show nothing abnormal, while from his former apathy in school the boy has become lively and unruly.

### PARATHYROID GLANDS.

Marine<sup>1</sup> has studied THE RELATION OF THE PARATHYROIDS TO TETANY in dogs. He found that accessory parathyroid tissue unassociated with the lobes of the thyroid is present in 5 to 6 per cent. of dogs. For the determination of the presence of accessory parathyroid tissue there are two tests: (1) The anatomic, often entailing serial sections of the neck and upper thoracic structures, and (2) the biological, consisting of the daily use of some calcium salt for two or three weeks. The latter is more easily carried out and more accurate. In the absence of all parathyroid tissue, calcium salts will not save the animal's life, while in the presence of active parathyroid tissue calcium will save it. Many factors other than the amount of parathyroid tissue removed influence the onset of tetany, among which are age, pregnancy, lactation, rachitis, the administration of sulphur and diet.

Hoskins and Wheelon,<sup>2</sup> from experiments on dogs, have found that parathyroid destruction results in a marked increase of vasomotor irritability as shown by the reactions to nicotin, epinephrin, and pituitrin. All components of the vasomotor mechanism, sympathetic cells, myoneural junctions and musculature, seem to be affected. The effects are of varying degree in different cases. There was observed no strict parallelism between the external symptoms of parathyroid deficiency and the degree of vasomotor irritability. Inconclusive evidence indicates that calcium injections in some measure restore vasomotor irritability toward normal. The sympathetic system offers no exception to the general increase of irritability that results from parathyroid extirpation.

Bergeim, Stewart and Hawk<sup>3</sup> have studied the metabolism of calcium in a man after complete removal of the thyroid and parathyroid glands. A slight retention of calcium (0.4578 gm. of calcium oxid in the ten-day period) was noted. The urinary calcium excretion was low, averaging 0.0134 gm. per day on a daily ingestion averaging 1.6736 gm.

<sup>1</sup> *Journal of Experimental Medicine*, January, 1914.

<sup>2</sup> *American Journal of Physiology*, June, 1914.

<sup>3</sup> *Journal of Experimental Medicine*, September, 1914.

of calcium oxid. A slight increase was observed during the period of study in the calcium content of the blood. No symptoms of tetany were noted in the patient, who survived operation thirty-nine days. The low urinary and blood-calcium values are taken to show deficient absorption of calcium, which may bear some relation to the decreased gastric secretion after parathyroidectomy. Attempts are made to explain the non-occurrence of tetany as due to the high calcium intake and to the development of a compensatory mechanism in which the pituitary body may play a part.

Lundberg, and later Berkeley, suggested that parathyroid insufficiency may be responsible for the symptoms of paralysis agitans. That these symptoms in many ways resemble those observed after removal of the parathyroids in the lower animals is true, but attempts at establishing a close relationship between the two have not been successful. Examination of the parathyroids removed from cases of paralysis agitans at autopsy has revealed no characteristic deviation from the normal. Berkeley laid great stress upon the results he obtained in the treatment of paralysis agitans with parathyroid preparations; others, however, did not obtain these favorable results.

Roussy and Clunet claim that the administration of parathyroid increases the severity of the symptoms, and, finding hyperplastic parathyroids at autopsy, they concluded that hypertrophy of the thyroid is an important factor in the etiology of paralysis agitans, which is contrary to the view of Lundberg and Berkeley. Greenwald<sup>1</sup> has attacked this problem from a direction indicated by some of his earlier experiments which showed that after parathyroidectomy there is a marked diminution in the excretion of phosphorus which persists until tetany appears, and often longer, and at the same time the blood and serum showed a decided increase in the phosphorus content above that of the normal. This increase is due almost entirely to those phosphorus compounds that are not soluble in acetone, alcohol and ether, but which are soluble in a mixture of dilute hydrochloric acid or acetic acid or picric acid. He reasoned that if parathyroid insufficiency is a factor in the etiology of paralysis agitans, probably a similar increase in the amount of acid-soluble phosphorus would be found in the blood-serum of patients with paralysis agitans. From Greenwald's results, which he tabulates, this increase of acid-soluble phosphorus in the blood-serum of patients with paralysis agitans was not found. Hence his results do not support the view that parathyroid insufficiency plays a role in the etiology of this disease.

### THE THYMUS.

**Experimental Researches.** Pappenheimer<sup>2</sup> has conducted experimental studies on the effects of early extirpation of the thymus in albino rats.

<sup>1</sup> American Journal of the Medical Sciences, February, 1914

<sup>2</sup> Journal of Experimental Medicine, April, 1914.



One hundred and eight rats were used by Pappenheimer for this study. Of these, 82 were thymectomized, the remainder serving as controls. He found that removal of the thymus does not produce an arrest or retardation of body growth and development. Qualitative changes in the skeletal system or teeth have not been found. In emaciated, weak animals, osteogenesis is less active than in healthy rats, and the long bones are smaller and more delicate in structure. Such quantitative differences appear to depend on the general nutrition, are equally pronounced in rats whose development is retarded from other causes and cannot be referred specifically to loss of thymus function. No constant or characteristic alterations were detected in the spleen, testes, adrenals or thyroid. Whatever functional correlations may exist between the thymus and any, or all, of these organs are not evident from the occurrence of histologic changes after the removal of the thymus. The relative proportion of lymphocytes in the blood is diminished for the first few weeks after the operation. Pappenheimer has not determined how long this alteration in the leukocytic formula persists.

Two rats were killed one hundred and eighty-five days after operation. Minute examination of a complete series of the neck organs, including the thyroid, failed to show any tissue which could be interpreted as thymus. The bones showed no rachitic changes.

In a later paper, Pappenheimer<sup>1</sup> reports the results of further studies on thymectomized rats to ascertain especially the effects of extirpation of the thymus on the skeletal system and the teeth. Lesions of the bones and teeth were observed in thymectomized rats, in controls of the same litters, in stock animals, and in a rat inoculated with bone marrow from a thymectomized rat with lesions of the skeletal system. These rachitic changes in the bones and teeth occur as the result of spontaneous disease, possibly of infective origin. This disease is often, but not always, accompanied by an arrest of growth and malnutrition.

Shimizu<sup>2</sup> has immunized rabbits against dog thymus and used the thymus-immune serum in studying experimental thymus function. Fifteen dogs were treated with the thymus-immune serum. They all showed more or less of the toxic phenomena which correspond to those of primary anaphylaxis. Twelve of these cases showed distinctly a typical change of the thymus, that is, decrease in size of the thymus gland, atrophy of the medulla accompanied usually by decrease in size of the individual lobules and increase in the growth of the connective tissue. In 2 cases a high-grade atrophy of the thymus was noted. These and two other cases showed the characteristic phenomena which has been observed and exactly described by earlier authors following thymectomy. The use of the thymus-immune serum in young dogs,

<sup>1</sup> Journal of Experimental Medicine, November 20, 1914.

<sup>2</sup> Mitteilungen a. d. med. Fakultät d. k. Univ. Tokyo, 1914, xi, No. 2.

aside from the anaphylactic phenomena, brought about widely distributed destruction of the thymus tissue; while normal rabbit serum, as well as an immune serum obtained through injection of dog spleen, showed no characteristic destructive influence upon the thymus, although they were markedly toxic to the young dogs and produced the phenomena of primary anaphylaxis. We may conclude from this that the thymus immune serum is specific, and indeed contains a thymus-destroying body or thymolysin which causes distinct atrophy of the medulla of the gland, and the animals treated show those physical and mental changes which earlier authors have observed following thymectomy. These researches lead us to the conclusion that the cortex of the thymus and the medulla of the thymus have biologically entirely different functions, and that the internal secretory function of the thymus is confined to the medulla. Atrophy of the cortex, inanition and exposure to the x-rays call forth no typical developmental changes in the animals.

In discussing the clinical importance of the thymus, von Haberer<sup>1</sup> says that the thymolymphatic state is common in his region of the Tyrol. Simple goitre is often accompanied by signs of abnormal thymus functioning, and the thymus has always been found enlarged in such cases. Haberer excised part of the thymus in 20 cases of the kind and always with the best effect. His experience confirms the assumption that both thymus and thyroid are responsible for Basedow's disease, the clinical picture being determined by the degree of involvement of each, the thyroid playing on the sympathetic, the thymus more on the vagus nervous system. The author reports a case in which a persisting thymus was suggested, in a man aged twenty-nine years, by the extremely tall growth, the pallor, infantile genitals and growth of hair, the unusual development of the follicles at the base of the tongue, and dulness extending along each side of the manubrium; palpation confirmed the presence of a large thymus. A fracture of the radius had healed in a vicious position and required correction, but, before attempting this, Haberer operated on the thymus, which proved the largest he had ever encountered. The thymus-reduction operation was easily done and the patient speedily recovered and then bore, without harm, the general anesthesia and operation on the radius. Harberer knows of no other case on record in which an operation was done on the thymus on the basis of the clinical diagnosis alone.

Sylvester<sup>2</sup> reports 6 cases of enlarged thymus, and discusses the symptomatology of hyperthymatism. In concluding, he says we should be more on the lookout for enlarged thymus in cases of asthma, persistent bronchitis, and laryngeal or tracheal stenosis. Inasmuch as the percussion outlines correspond so closely with those shown by

<sup>1</sup> Med. Klinik, June 24, 1914.

<sup>2</sup> Boston Medical and Surgical Journal, April 2, 1914.

röntgenograms, the enlarged thymus should be found on examination by the ordinary methods of physical diagnosis, of which threshold percussion is apparently accurate and satisfactory in the hands of one familiar with children. Children showing enlarged thymus present two fairly uniform sets of respiratory symptoms; (a) those due to pressure on the trachea, as shown by cyanosis, slow, labored breathing, and supraclavicular and substernal retraction; (b) those presumably due to toxemia or hypersecretion of the thymus, namely, breathing of the asthmatic type characterized by fairly easy inspiration and long, difficult expiration accompanied by rales. Inasmuch as in all the cases treated the symptoms for which treatment was instituted disappeared when the physical evidences of an enlarged thymus disappeared, there is a relationship between (a) the enlarged thymus and the pressure symptoms; (b) the enlarged thymus and the asthmatic symptoms which were obviously not due to pressure; therefore probably due to hypersecretion. Pressure symptoms and toxic symptoms may be combined in the same case, but those of the toxic type are more constant.

Delavan<sup>1</sup> advocates with emphasis the use of Röntgenograms in the diagnosis of enlargement of the thymus. He cites 2 cases to support his views and states that numerous other cases might be collected for the same purpose. He says, "without doubt the use of the *x*-rays before operation would result in the saving of lives." The examination of every child, therefore, would seem desirable. This, however, he concludes is impracticable, but, since this is so, it should be urged that in any suspected case an *x*-ray examination should be made before operation is attempted.

### THE ADRENAL GLANDS.

**Experimental Researches.**—Hoskins and Wheelon<sup>2</sup> have studied experimentally *adrenal deficiency in relation to the sympathetic nervous system*. Complete ligation of both adrenal glands of dogs at a single operation was found to cause, within four or six hours, characteristic weakness of the skeletal muscles, including those of respiration. The weakness is shared to a marked degree by the cardiac muscle. At a time when cardiac weakness is strongly in evidence, blood-pressure remains at, or near, its initial height. A compensatory activity of the vasomotor system therefore occurs. Vasomotor responses to faradic stimulation of the crural nerve persist. The vasomotor reactions to epinephrin also persist undiminished. The reactions to nicotin are often somewhat exaggerated as compared with preliminary observations with the same dosages. The vasomotor system, therefore, as well as the vascular musculature, are unimpaired at a time when marked

<sup>1</sup> Medical Record, New York, October 17, 1914.

<sup>2</sup> American Journal of Physiology, May, 1914.



asthenia of skeletal and cardiac muscle has developed. This asthenia is sufficient alone to account for the final fatal results of adrenal extirpation. The author found no evidence, therefore, that the sympathetic system suffers primarily in any degree from adrenal extirpation.

Crowe and Wislocki<sup>1</sup> have found, from experimental observations on the *adrenals with reference to the functions of their internal portions* that in the dog the adrenals are vital organs, and it is probably the cortex rather than the medullary portion which is essential to life. After a partial extirpation of the adrenal, the remaining portion undergoes hypertrophic changes. The increase in size is due to a multiplication and enlargement of the cells of the cortex, chiefly in the fascicular zone; the medulla shows no hypertrophic changes, either grossly or microscopically. A chronic infection in an animal with an adrenal insufficiency is occasionally associated with an interstitial fibrosis and destruction of the cells of the fascicular zone of the cortex. An acute general infection in an animal with an adrenal insufficiency produces, in some instances, focal areas of complete cell destruction (without hemorrhage) in the fascicular zone of the cortex of the remaining portion of the adrenal. In no instance have the authors seen hemorrhages or injury to the cells of the medulla of the adrenal resulting from an acute or chronic infection in the dog.

After an "almost total" removal of both adrenals, the animals often have general convulsive seizures, a subnormal temperature, and other symptoms of an acute adrenal insufficiency; in some instances, recovery gradually ensues after such symptoms and the animal subsequently develops in a normal manner as regards growth and sexual functions. There is also no change in disposition. They increase in weight, but not to an abnormal extent. No polyuria has been found.

There is no permanent raising or lowering of the carbohydrate tolerance resulting from an adrenal insufficiency. A transient glycosuria follows the operative manipulation of either the right or the left adrenal.

An autoplasmic transplantation of a fragment of adrenal may "take," but is of no functional value. When a fragment of adrenal containing both cortex and medulla is transplanted, the cortical cells may survive, but the medullary cells are absorbed.

There seems to be a definite relationship between the adrenals and the lymphatic system. The most striking feature at autopsy on an animal with a long-standing adrenal insufficiency is the enlargement of the mesenteric and retroperitoneal lymph glands and the solitary lymph follicles in the walls of the intestine. Not infrequently there is also an hyperplasia of the thymus. Further observations are being made by the authors to confirm these findings.

Finzi<sup>2</sup> has studied the changes taking place in the gastric mucosa

<sup>1</sup> Bulletin of Johns Hopkins Hospital, October, 1914.

<sup>2</sup> Virchow's Archiv f. path. Anat., 1914, ccxiv, No. 3.

after removal of the adrenals. He bases his conclusions on experiments carried out on rabbits and dogs, and on the findings obtained from five autopsies on human subjects. In the animals after complete or partial abolition of adrenal functioning there were marked changes in the mucous membrane of the stomach, consisting in circulatory disturbances, edema, hemorrhage, and necrotic processes, the severest of which only exceptionally showed even slight tendency to heal. His reasons for assuming that the stomach lesions were caused by the adrenal disturbance are because they were less severe and recovered more readily when only one adrenal was removed; because they were not found in a rabbit which, in spite of removal of the adrenals, showed no signs of decreased adrenal function; because the stomach lesions were not found when the operation consisted simply in removing the adrenal capsule, and because they were lacking when the rabbits, after removal of the adrenals, were given epinephrin or adrenals were transplanted from other rabbits. In five cases of stomach or duodenal ulcer in human beings, microscopic examination showed marked changes in the adrenals, thickening of the capsule, nodular hypertrophy, fatty degeneration, great congestion, and multiple hemorrhages.

Sydenstricker, Delatour and Whipple<sup>1</sup> have carried out experiments to determine the adrenalin index in normal and various experimental conditions. The index, as used by them, means the amount of adrenalin in milligrams per gram of gland. The two adrenal glands in the same individual, according to the authors' findings, as a rule, contain about the same amount of adrenalin per gram, but variations of 10 to 20 per cent. are not unusual. Normal dogs show an index which may vary from 1.2 to 1.8 milligrams. Normal human beings dying from trauma, rupture of an aneurysm, etc., show an index of 0.35 to 0.5 of a milligram when autopsy takes place a few hours after death. The deterioration of uncut gland or of a gland-hash kept on ice in the dark is not rapid and rarely exceeds 10 per cent. in twenty-four hours. Acute intoxication in dogs shows a low adrenalin index, especially the intoxication associated with intestinal obstruction and the closed intestinal loop. Intravenous injection of the poison found in closed duodenal loops sufficient to cause fatal shock causes a great drop in the adrenalin index, at times to one-fourth normal or even lower. After recovery from a sublethal toxic dose, the adrenalin index may rise rapidly to a point considerably above normal; the same may hold for recovery after chloroform poisoning. Anesthesia by chloroform or ether causes a drop in the adrenalin index depending upon the length of anesthesia and probably, in part, on the depth of anesthesia. Liver poisons (chloroform, phosphorus, hydrazin) cause a drop in the adrenal index to a low level, perhaps one-half normal in acute cases. Pancreas extir-

<sup>1</sup> Journal of Experimental Medicine, June, 1914.

pation, with prolonged glycosuria and death, produces a great drop in the adrenalin index (cat). There is evidence that this may hold in some cases of human diabetes. In man, disease of one adrenal (tuberculosis) may be associated with an adrenal index of double the normal value of the intact adrenal. Pernicious anemia is the only disease so far found to present an abnormally high adrenalin index, and the single case shows an index at least twice normal. This is of interest, especially in relation to the views recently put forward to indicate that the spleen and adrenal may be concerned in the lipoid metabolism which is thought to be profoundly disturbed in this disease. Secondly, anemia due to repeated hemorrhage, or the intoxication of cancer or tuberculosis, causes a fall in the adrenal index. Cachexia due to neoplasm or tuberculosis may cause a marked fall in the adrenalin index perhaps to less than one-half of normal. Acute infections (typhoid fever), septicemia, peritonitis, and similar conditions, may be associated with a normal adrenalin index or one somewhat below normal. Diseases of the kidneys, heart or bloodvessels associated with elevated blood-pressure show no constant variation in the adrenalin index which may be normal or slightly subnormal.

From experimental work on animals and clinical observation, the researches of Reich and Beresnegowski<sup>1</sup> on the adrenalin content of the suprarenal glands lead them to the conclusions that in acute peritonitis in man more than one-half of the cases show a poverty of chromaffin in the suprarenals which is not compatible with normal adrenalin secretion. In a number of cases of human peritonitis, apparently an acute insufficiency of the adrenals is responsible for a central vasomotor paralysis and weakness of the circulation. It is not probable that the different kinds of lethal infections produce so rapid and so intense a destruction of the medulla of the adrenal glands, as was found to be the case in acute peritonitis.

Oliva<sup>2</sup> has experimented on dogs with the idea of studying the epinephrin content of the adrenals after anesthesia. He found that the decrease after chloroform was much greater than after ether, and that it persisted for a long time, while after ether the adrenals became normal again in ten to twelve hours. When morphin was given before the chloroform, it seemed to delay the bad effect on the adrenals, but only so long as the influence of the morphin persisted. After that the epinephrin content was persistently lowered, just as in the cases where morphin was not given. Morphin given before ether did not seem to make any special difference in the effect of the anesthetic. Chloroform, therefore, is much more toxic than ether, as it inhibits the tonic effect of the epinephrin on the sympathetic nervous system. A large part of the serious results following chloroform anesthetization may be prevented by giving epinephrin in conjunction with it.

<sup>1</sup>Berlin g. Clin. Chir., May, 1914.

<sup>2</sup>Lyon Chirurgical, January, 1914.



**Pathology.**—Elliott<sup>1</sup> has carried out extensive investigations of the pathological changes which take place in the adrenal glands under various conditions of health and disease. In summarizing, the author states that from all the detail of these studies there emerges at any rate one generalization, that the cortical lipid is stored and consumed under conditions entirely different from those which control the body fat in general. The starvation of cancer, diabetes, and especially of anorexia nervosa, strips the fat from the body; it leaves unchanged the lipid of the adrenal cortex. Pathological intoxications, such as that in diphtheria, increase the apparent fat in the heart and kidney; they only exhaust the cortical lipid. Except in the degenerating areas of the fetal cortex, there is no abnormal accumulation of fat in the adrenal under ordinary conditions of disease. On the contrary, there is actual loss. The lipid vanishes with great rapidity in acute septic fevers, slowly in chronic fevers; and it is also diminished in severe hemorrhage and anemias.

The load of lipid is not directly related to that of adrenalin. It is true that both are reduced in septic fevers, but there are several conditions in which the adrenalin is lessened without any change in the lipid. The clearest example of this was where circulatory failure and mental distress had exhausted the medulla, yet the cortical fat seemed normal. So, too, the adrenalin is lessened by the strain of a surgical operation, which leaves the lipid unaffected. In his experiments on cats, exhaustion of the adrenalin was produced in various ways; in none of these was any alternation detected in the cortical fat, and there was no suggestion that the latter was controlled, like the adrenalin in the medullary cells, by the splanchnic nerves.

The nature of this loss of cortical lipid cannot be explained by the evidence at present available.

It might be that the mere rise of temperature in the fevers carries it away by a change of physical state. Such non-septic hyperpyrexia as occurs in some fatal cerebral hemorrhages would be of great value in answering this question as to whether the loss is caused by poisoning or simply by the rise of temperature. I have not had the opportunity for such an analysis apart from the exhausting complications introduced by bronchopneumonia. But one case studied, in which a final temperature of 107° was reached after a cranial operation, comes near to the desired condition, and in it the fat was normal. Experimentally, he compared the glands of cats under ether, of which the one was cooled to 96°, rectal temperature, and the other heated to 107° (normal 100° to 102°) for three hours. No alteration could be detected in the adrenal lipid. Hence it does not seem probable that this simple physical change suffices to explain the disappearance of the lipid.

<sup>1</sup> Quarterly Journal of Medicine, October, 1911.

A second suggestion is that the cortex is concerned in upholding the cholesterol ether content of the blood, and that the latter may play an essential part in resisting the poisonous effect of the bacterial infections, while its excess may lead to atheromatous changes in the walls of the bloodvessels. Workers abroad have shown that the cholesterol percentage in the blood sinks in fevers. Some such relationship would also serve to explain the frequent diminution of the adrenalin lipoid in severe hemorrhages, when these substances may be lost to the body with the escape of the blood. There is no satisfactory experimental evidence on this point. Gardiner and Lander, by chemical analyses in starved cats, found that the cholesterol of the adrenals fell during starvation, while that of the blood was still upheld. Weltmann was inclined to think that infections in guinea-pigs caused at first an actual increase in the lipoid, and that exhaustion followed rapidly as the intoxication increased.

On the other hand, the special growth of the cortex in the human fetus—provided that the cerebral hemispheres of the child are developing to their full measure—and its partial atrophy after birth, just when the infant is exposed to a world of new bacterial infections, seem totally opposed to any theory which would connect the lipoid with the febrile reactions of septic infection.

Bodily growth and sexual maturation are undoubtedly controlled to some extent by the adrenal cortex. The evidence reviewed by Glynn<sup>1</sup> is conclusive on this point. Morphologically, the cortical cells are related to the interstitial cells of the generative glands, upon which in the testicle the male characteristics of the body depend. The cells in the testis, like the lutein cells of the ovary, contain a lipoid closely resembling that of the adrenal. But it is obvious that this fatty substance is unlikely to be the material by which sexual maturation is effected, if it can disappear in the course of a couple of days' fever. And it must be remembered that the lipoid is not present in the adrenals of all mammals, nor always in the testicles. The growth function is probably to be ascribed to some other secretion of the cells than the lipoid. Curiously, the fat in the sex glands was found to show changes closely parallel to that of the adrenal cortex. Thus it was abundant in the lutein cells of an emaciated woman; it was lost in a case of febrile disease, and moderately exhausted in another case. Similar changes were seen in the testicles, though the comparison was not analyzed with sufficient detail.

The author saw no examples of sexual precocity associated with cortical tumors, and no pathologist, into whose hand such material has fallen, has, so far as he is aware, considered the presence or absence of lipoid in the growth. Hypernephromata arising in the kidney in

<sup>1</sup> See PROGRESSIVE MEDICINE, June, 1913.

some instances do secrete a lipid. In two cases examined by Elliott, the lipid was also secreted by the cells in the secondary deposits elsewhere, yet the patients exhibited no special symptoms that could be ascribed to this material, and no atheromatous changes were found in their aortæ.

Adenomata are common in the cortex, and they are always abundantly laden with lipid. Their cells, though well vascularized, do not part with the fat so quickly as does the normal cortex in fever, a fact which suggests that there may be some obscure nervous control of the cortical cells. They arise chiefly from the cortical islets, embedded in the medulla, but they do not cause pressure symptoms, as do those of the thyroid or pituitary; and it cannot be said that their presence is a mark of special disease and an index that the gland's functions have of late been either exalted or depressed. In five of the cases quoted in this paper, the adenomata were very large, so much so as to double the weight of the gland. Two were tuberculous patients, but this seemed to be only a chance association. One was from chronic renal disease.

Small, multiple adenomata of the cortex are very frequent, and they tend to appear with greater frequency in renal cases, though some cases show that the phenomena of kidney disease and high blood-pressure could be developed for a long time without the growth of these nodules.

The conclusions arrived at by Elliott are that the normal adrenal gland of an adult man weighs between 4 and 5 grams and contains from 4 to 5 mg. adrenalin. There is no proof that the store of adrenalin in the medulla is increased in any disease. The adrenalin is lessened in many infective diseases, but probably not to such a degree as to endanger the circulation. The greatest loss was observed in examples of afebrile acute cardiac failure associated with mental distress in the struggle to live. The lipid of the cortex is stored and lost under conditions entirely different from those which govern the other fats of the body. It does not disappear in extreme bodily emaciation. The cortical lipid vanishes with great rapidity in all acute febrile infections. There is a tendency for it to appear in excess in chronic renal disease, especially in conjunction with arteriosclerosis.

**Relation to Sex Development.** Benda<sup>1</sup> reports a case of pseudo-hermaphroditismus femininus externus. The case was that of a two months old child apparently of the male sex. Of the sex of the child there had been no doubt whatsoever. At postmortem examination, however, there was discovered behind the bladder a complete set of internal female sex organs. Examination of the suprarenal glands showed them to consist exclusively of cortical substance. In the stratum fasciculare no lipid could be demonstrated. Medullary substance was

<sup>1</sup> Berlin. Klin. Woch., January 12, 1911



absent. The red color of the internal mass of the structure was caused by distended bloodvessels.

Jump, Beates, and Babcock<sup>1</sup> report a case of precocious development of the external genitals due to hypernephroma of the adrenal cortex. The case was that of a girl of seven years with a clear family history. She was one of twins, the twin sister being much smaller and of a very different temperament. When one year old the child began to develop rapidly, and a growth of hair was noticed first over the pubes, the legs and trunk. The skin of the abdomen and legs was rough.

She grew rapidly and showed a surprising mental and physical development. As she began to talk it was noticed that her voice was much deeper than that of a child, and, at the age of six or seven years, a laryngoscopic examination showed a development of the larynx, and vocal cords suggesting that of an adult man. She proved an apt scholar and attained high grades in her school work. Her strength was phenomenal for one of her years. At seven years of age she developed a growth of hair on the face which resembled that to be found on a boy of seventeen or eighteen years. The arms and legs were muscular, suggesting masculine development. She had never menstruated. On examination, the abdomen was found to be greatly distended, especially on the right side, by a dense elastic mass which extended from the costal border to the pelvis. Upon operation, an enormous perivascular and adherent hypernephroma was found. (Diagnosis was confirmed by microscopic examination.) The growth involved the whole of the right kidney. The left kidney and adrenal gland were normal. No metastatic growths were found in the abdomen. The pituitary body was normal; the uterus and ovaries were infantile in type.

Baldwin<sup>2</sup> reports a similar case occurring in a boy, aged five years and ten months. He was rather underdeveloped when born and the father thought that sex development commenced when he was about eighteen months old. He began to walk and talk at nine months, and at ten months he could talk well and "run like a partridge." After that his mental development ceased to keep pace with his physical. When he was three years old there was hair on the pubes and face, and he had a voice like a man. In December of 1913 it was noticed that his abdomen was getting larger. This enlargement continued quite rapidly. The patient in height and weight was about normal for his years, but his facial expression was that of a man of thirty-five or forty years. He had been shaving for some time. The genital organs were apparently those of an adult, except that the testes were small and not completely descended. On examination, a large tumor was found in the abdomen, more pronounced on the left side. It was adherent and nodular. There seemed to be a second mass on the right

<sup>1</sup>American Journal of the Medical Sciences, April, 1914.

<sup>2</sup>Journal of the American Medical Association, December 26, 1914.

side but no connection between the two could be demonstrated. The child could utter some words and the voice was like that of an adult, but mentally he was a mere child. Death occurred, and at necropsy there was found a large tumor in the abdomen lying between the layers of the mesentery of the descending colon. This weighed about fifteen pounds, measured  $12\frac{1}{2} \times 9$  inches, and showed several protruding nodules. On section, the mass was soft and well marked off into medulla and cortex. Its origin was evidently the left suprarenal gland. The right kidney was normal, but its suprarenal gland was about the size of a walnut, red and friable. The liver was full of metastatic nodules. Microscopic examination showed the pituitary body and the pineal gland to be normal, also the thyroids and parathyroids. The kidney showed a diffuse chronic parenchymatous nephritis. The testes were normal for a boy of his age. The large, abdominal tumor was typical of a rapidly growing hypernephroma involving the adrenal cortex. The right adrenal showed a beginning hypernephroma similar to the left.

Tuffier<sup>1</sup> observed a case of adrenal virilism in a woman, aged sixty-two years, who had consulted him for metrorrhagia. Upon examination, a large fibroma was found, but the urine contained 7 per cent. of sugar and the author hesitated to operate. Tuffier noted an extraordinary development of hair on various parts of the body, and on one occasion the woman presented a heavy black beard and mustache. The face was red and swollen. A slight exophthalmos was to be noted and a fronto-parietal baldness, which is almost exclusively masculine, was present. The limbs were very muscular and of masculine proportions. The clitoris was hypertrophied, measuring about 4 cm., and was covered by a well developed prepuce. This phenomenon, according to the patient, did not develop until after the menopause. Her habits had also changed. She preferred heavy manual labor, such as plowing and digging, and this did not tire her in the least. Under treatment, the sugar was reduced to 0.6 per cent. and operation was undertaken. In the course of the laparotomy, examination of the suprarenal region revealed a bilateral mass of a fibroid-lipomatous consistence. There was atrophy of the left ovary and the right ovary showed a tumor of the size of a walnut, soft and hemorrhagic. The uterus was not sclerotic or fibromatous but showed muscular atrophy.

FUNCTIONS.—While carrying out perfusion experiments on the kidneys of cats, Cow<sup>2</sup> was struck by the different effects produced by perfusion: (a) directly through the renal arteries, and (b) through the aorta. The experiments in which the perfusion fluid flowed directly into the renal arteries showed invariably a progressive rise in the amount of urine, usually accompanied by a progressive increase in the rate of flow of the perfusion fluid. Those experiments in which the perfusion was

<sup>1</sup> Bull. de l'Académie de méd., 1914, lxxviii.

<sup>2</sup> Journal of Physiology, September, 1914, xlviii, No. 5.

made into the aorta, on the other hand, showed a progressive fall in the amount of urine, accompanied by a progressive fall in the rate of flow of the perfusion fluid. After excluding all possible sources of difference in the conditions of the experiments, the only feasible explanation appeared to be that in those experiments in which the perfusion was made into the aorta there was a circulation through the suprarenal bodies. The author then devised and carried out experiments to test this question, and, from the results obtained, arrived at the conclusion that a direct vascular connection exists between the medullary portion of the suprarenal bodies and the kidneys. Under certain conditions adrenalin in appreciable amount is poured directly into the kidneys from the suprarenal bodies, producing a diminution in the flow of urine. The suprarenal bodies may be regarded as direct regulators of urinary activity.

Hoskins<sup>1</sup> has investigated the *relation of the adrenals to the pulse rate*, and has found that intravenous injections of epinephrin under conditions closely simulating adrenal discharge cause, not only increased blood-pressure, but also accelerated pulse. Acceleration of the pulse he therefore regards as one of the adaptive functions of the adrenal glands.

In discussing the significance of the adrenals, Hoskins<sup>2</sup> summarizes by saying that the available evidence indicates that the adrenals secrete a substance, epinephrin, of remarkable potency. This substance selectively affects the tissues having sympathetic nervous control, thereby affecting many vital functions. Adrenal discharge occurs when the individual is subject to stress, as strong emotions, pain, or asphyxia. The discharge integrates the body for muscular response: (*a*) By shifting the blood from the vegetative to the motor, nervous and respiratory organs; (*b*) by increasing blood-pressure; (*c*) by causing discharge of dextrose into the blood for use of the laboring muscles; (*d*) by dilating the bronchioles, permitting freer breathing, and (*e*) by reducing fatigue. It also hastens the coagulation time of the blood; *a*, *b* and *c* are of direct clinical importance.

During quiet existence the epinephrin secretion, if occurring at all, is below the threshold necessary to stimulate the sympathetic system. Sympathetic activity *per se* is not impaired by adrenal extirpation.

Adrenal destruction results in fatal asthenia of the skeletal and cardiac muscle. This is probably due to loss of adrenal cortex, not epinephrin-secreting tissue. Addison's disease is probably due, therefore, to functional failure of the adrenal cortex.

Zuloaga<sup>3</sup> calls attention to the insufficiency of the adrenals during pregnancy. He details two cases of an extreme type of this occurrence in which uncontrollable vomiting, diarrhea, cold sweats, syncope and

Journal of American Medical Association, July 25, 1914.

Ibid., June 6, 1914.

Arch. Mens. d'Obstét. et de Gynéc., May, 1914.



nervous excitement occurred along with high pulse rate, rapid and shallow respirations, and low blood-pressure. Improvment followed the administration of epinephrin. All symptoms eventually subsided and pulse and pressure returned to normal. On suspending the epinephrin after a month's treatment of one of the cases, vomiting reappeared and the condition was again controlled by administration of this drug.

### THE PINEAL GLAND.

An excellent and exhaustive review of our knowledge of the pituitary body is presented by Goetsch.<sup>1</sup> This article is too extensive for abstracting, and the reader is referred to the original paper.

A most interesting lot of experiments have been carried out by McCord<sup>2</sup> to determine the relation of the pineal gland to somatic, sexual, and mental development. On the hypothesis that precocious development is due to hypopinealism, the first work of the author was done in anticipation that feeding would retard development and prolong the presexual life. This was begun on two chicks incubated in the laboratory. Beginning at the age of two days, one was fed 10 mg. of veal pineal tissue three times weekly. The other (and in all cases of controls) was fed a blank tablet of milk sugar. The difference in growth was striking 127.02; 71.2; 345; 225 grams constituted the difference in weight between these chicks during the third, sixth, ninth, and twelfth weeks respectively. The striking disproportion in size and the marked skeletal overgrowth making the larger chick very awkward in his movements soon made these chicks laboratory curiosities, and these results were so striking that at once work was instituted in a more extensive way. Similar experiments were carried out on a lot of 50 guinea-pigs, dividing them into experimental and control groups. Here the difference in growth was again well marked, the excess gain of the pineal fed pigs over the controls being 23 per cent. This excess is a symmetrical overgrowth and at no time was it possible to continue the excess of growth above the normal adult size. As the animals approached adult size, the pineal feeding was less and less effective, and after full maturity was without effect. There was no tendency to gigantism. An interesting experiment was carried out on fourteen chicks secured at the age of one week. The test chicks were placed on veal pineal tissue for one week, with a resultant greater growth than the controls. For the next four weeks they were fed pineal tissue from old cattle without gaining. Upon being placed on the original veal preparation, the test chicks again grew in excess over the controls. Experiments were also carried out on eighteen puppies. In this series, infections interfered seriously with the average results over prolonged periods. No great

<sup>1</sup> Quarterly Journal of Medicine, January, 1914.

<sup>2</sup> Journal of American Medical Association, July 18, 1914.

import was attached to the observations in this series, but it was noted that the pineal fed puppies were about one month ahead of the others in their habits. They were the first to learn to lap milk, the first to respond to a call, and the first to find their way back to the kennel, showing a definite difference in the conditions of the two groups. Forty-eight guinea-pigs were divided into test and control groups, with the idea of determining any precocious sexual development. As a measure of any difference in sexual development, it was thought desirable to note the date of birth of young in the two lots. All except two of the pineal fed pigs gave birth to young before the first of the controls, and fourteen days elapsed between the birth of young of the first pineal fed pig and the first control pig. In all cases the young were normal and in no way different from any other young pigs. In a second series of fifty guinea-pigs observed as to sexual differences, the males and females were kept together from birth. Some of the pineal fed females gave birth to young, and many others were within the last ten days of gestation, while with the exception of one pig the control animals evinced no signs of pregnancy. As a result of this work the author is led to conclude that the administration of minute quantities of pineal tissue to young animals stimulates rapid growth of the body, but not beyond normal size and that there are less well established indications of precocious mental and sexual development.

Wulzen,<sup>1</sup> carrying out feeding experiments with young fowls and using unmodified anterior lobe of ox pituitary, found that growth is retarded by the addition of this article of diet. This was shown in the body weight and in the length of the long bones. He noted that involution of the thymus accompanies this retardation of growth, and may perhaps bear a causal relation to it. The effects were more marked in the males than in the females.

Kleemann,<sup>2</sup> in a study of the action of hypophysis extract derived from castrated animals, or from those from which merely the corpora lutea were extracted, found that the effect was the same as that derived from normal animals; but, when the extract was obtained from the hypophysis of gravid animals, the effect of its injection was different. Sometimes it acted as a vasodilator and sometimes as a vasoconstrictor. He suggests that the contradictory experiences with hypophysis extract which have been reported may be explained by the fact that the extract in some cases was derived from an animal that was, or had recently been gravid, and he recommends that in the preparation of the extract only those hypophyses should be used which are taken from animals that have not recently been gravid or from those that have been previously castrated, and, further, that a period of time should be allowed between castration and extraction of the hypophysis, because castration

<sup>1</sup> American Journal of Physiology, May, 1914.

<sup>2</sup> Archiv für Gynäkologie, 1914, ci, No. 2.

influences the hypophysis secretion only after a certain period of time has elapsed.

From his experiments on guinea-pigs, and his observation of a case of idiopathic diabetes insipidus, Römer<sup>1</sup> was able to confirm the observation of Schäfer, Herring, Frank, Simmonds, and others, that a close relationship exists between the hypophysis cerebri and the occurrence of diabetes insipidus. However, he thought that this relationship did not exist in the heretofore accepted sense of a hyperfunction of the pars intermedia, but, as Von den Velden and Farmis have maintained, in the sense of a deficiency of the products of the hypophysis, especially of the pars intermedia.

Bergeim, Stewart and Hawk<sup>2</sup> studied *the metabolism of calcium, magnesium, sulphur, and nitrogen in acromegaly*. They found a distinct retention of calcium, magnesium and phosphorus which was not accompanied by corresponding changes in the general metabolism, as evidenced by a practical balance of nitrogen and sulphur. They conclude that there is a primary disturbance in the metabolism of the mineral elements mentioned, with the probable formation of new bony tissue. The distribution of elements between the urine and the feces showed no abnormal variation. They suggest, as a possible explanation of a variable calcium output in the urine while the subject is on a uniform diet, that there is a relation between the absorption, particularly of calcium, and the accumulation in the intestine of residual material rich in salts which are soluble with difficulty.

In concluding a report of three cases of pituitary disease, with a discussion of the conditions, Dunn<sup>3</sup> presents the following nosological schema, which, although not comprehensive, serves very well to sketch the conditions resulting from the failure of the pituitary gland to discharge its particular functions in the interlocking glandular directorate which controls metabolism, growth, and sexual life:

1. Affections of the pars anterior:

- (a) Hyperfunction—acromegaly, gigantism.
- (b) Hypofunction—true, or pituitary, dwarfism (not chondrodystrophic, rachitic, or cretinic dwarfs).

2. Affections of the pars posterior:

- (a) Hyperfunction—diabetes insipidus
- (b) Hypofunction—hypophysial obesity (dystrophia adiposogenitalis).

3. Mixed affections:

- (a) Hyperfunction of the pars anterior with hypofunction of pars posterior—acromegaly with hypophysial obesity.
- (b) Hypofunction of both lobes—dwarfism with hypophysial obesity.

<sup>1</sup> Deut. med. Woch., January 15, 1914.

<sup>2</sup> Journal of Experimental Medicine, September, 1914.

<sup>3</sup> American Journal of the Medical Sciences, August, 1914.



4. Hypophysial disturbance in conjunction with perverted activity of the other glands.

(A) Ovarian or testicular hypofunction with:

- (I) Hyperfunction of pars anterior—acromegaly, with sexual impotence—eunuchoid giants.
- (II) Hypofunction of the pars anterior—pituitary dwarfism, with sexual impotency.
- (III) Hypofunction of pars posterior—*dystrophia adiposo-genitalis*—genital obesity.

(B) Associated with disturbances in the functions of other ductless glands, *i. e.*, adrenals, pancreas, thyroid, pineal gland, thymus (*status thymolympathicus*), etc.

A remarkable case has been reported by Simmonds.<sup>1</sup> A previously healthy woman, aged forty-six years, developed severe puerperal sepsis which gave rise to septic necrosis of the pituitary body. In consequence of the loss of this important organ, a "senium precox" set in, with the appearance of the menopause, muscular weakness, vertigo and attacks of unconsciousness, anemia and rapid ageing. The remaining intact fragments of the gland atrophied gradually in the surrounding connective tissue. When the organ became absolutely inefficient, the woman died in coma. The autopsy showed an almost total disappearance of the hypophysis.

In treating a case of *dystrophia adiposo-genitalis* occurring in a Swede, aged twenty-seven years, Waitzfelder<sup>2</sup> implanted the pineal gland obtained from a robust German of twenty-five years in apparently good health who had committed suicide ten hours previously. The remarkable thing about this case was the mental state which the patient developed on the day following the operation. Within twenty-four hours he seemed to revert in his mentality to the condition of prehistoric man. The veneer of civilization was torn off and his mental and physical state was that of a cave dweller of the stone age. The author had anticipated, if any change occurred, an ascent in the intellectual scale, instead of which a marked decline occurred. It seems a fair inference that what took place was due to the activity of the internal secretion of the pituitary, inasmuch as it developed on the day following the introduction of the gland and subsided after a length of time which might be sufficient to allow the gland to be absorbed. It seemed to be coincident with the viability and activity of the transplanted pituitary gland.

An interesting case of *acromegaly and splanchnomegaly* is reported by Eltester.<sup>3</sup> The pathologic-anatomical diagnosis was acromegaly splanchnomegaly, hypophysis tumor, enlargement of the liver, spleen,

<sup>1</sup> Deut. med. Woch., February 12, 1914.

New York Medical Journal, November 21, 1914.

<sup>3</sup> Med. Klinik, August 2, 1914.

heart, kidneys, lungs and adrenals, persistence of the thymus, hypertrophy of the thyroid, atrophy of both testes, enlargement of the tongue, tuberculosis of the lungs, of the sphenoid bone, and of the ethmoid bone. The cause of death was the pulmonary tuberculosis. In discussing the primary cause of the acromegaly, the author considered the hypertrophy of the thyroid on the one hand and the atrophy of the sexual glands on the other hand, which conditions are so often found in association with this disease and therefore makes one think of a polyglandular origin. He excludes the sexual glands as a cause on the ground that the sexual organs were apparently normal and libido sexualis present seven years after the onset; while ten years after the onset the spermatic fluid contained neither prostatic secretion nor spermatozoa, and, at autopsy, the testes were markedly atrophic. He excludes the thyroid as a primary cause on account of the absence of any particular phenomena attributable to this gland, and because, ten years after the beginning of the disease, no enlargement of the thyroid could be demonstrated. The tumor of the hypophysis was diagnosed as a round-cell sarcoma. From these findings the author concludes that the hyperplastic growth of the hypophysis comes into question as the primary cause of the disease.

In summarizing a case of infantilism in a male sixteen years of age, McCready<sup>1</sup> says the skeletal over-growth, quantitative and qualitative, the small sella tursica, the carbohydrate tolerance, polyuria, absence of perspiration, absence of pubertal changes all point to an etiological complex with hypopituitarism as a prominent factor. The sudden growth response to pituitary feeding, tends to confirm this assumption, though it is granted that it is possible that this may have been only coincident.

### DIABETES MELLITUS.

The literature of the year on diabetes, as usual, has been extensive. Important work on the metabolism of the condition has been done, and several interesting facts concerning the chemistry have been brought to light.

Fürth<sup>2</sup> has studied the *elimination of lactic acid in the urine and its connection with carbohydrate metabolism.* The experiments were carried out on normal guinea-pigs, animals in which a hyperglycemia was induced by overfeeding of glucose and animals in which hypoglycemia was induced through starvation and the injection of adrenalin, resulting in an increased loss of sugar through the urine. The hyperglycemic and hypoglycemic animals were subjected to cooling to the extent of 25° to 30° C. Under these conditions the hyperglycemic animals responded with a marked output of lactic acid in the urine. In one of

<sup>1</sup> Illinois Medical Journal, October, 1914.

<sup>2</sup> Wiener klin. Woch., June 18, 1914.

these animals the lactic acid output occurred without the stimulus of the cooling process, being brought about simply through the condition of hyperglycemia. In the hypoglycemic animals the cooling process in no case produced an output of lactic acid. The author concludes that these experiments show clearly the dependence of the excretion of lactic acid on the carbohydrate balance of the organism.

Macleod<sup>1</sup> has carried out bio-chemical investigations to determine *whether any of the glycogen, which disappears from the liver under certain conditions, becomes transformed to lactic acid.* In a typical experiment it was found, for example, that the normal percentage of dextrose was 0.128 and of lactic acid 0.043. After applying a clamp to the portal vein and hepatic artery for five minutes, the sugar percentage rose to 0.226 and the lactic acid to 0.057, and these values fifteen minutes later were 0.107 and 0.076 respectively. The local asphyxia produced in the liver cells by cessation of the blood supply was, therefore, followed by an increased discharge of sugar and lactic acid. In the case of the lactic acid invariably, and in the case of the sugar in nearly all of his experiments, the increase was most marked, not in the blood which escaped immediately after the removal of the clamp, but in that collected fifteen minutes later. The author, therefore, concludes that the local asphyxia of the liver cells causes sugar and lactic acid to be produced in very excessive quantities; and, although in this act alone there is no warrant for concluding that glycogen is the source, yet from numerous other experiments in which glycogen had been determined he felt almost certain that this was the case. He sums up by saying that the products of glycogen broken down in the liver may comprise, besides dextrose, some colloidal substance (a dextrine) and lactic acid.

Landsberg,<sup>2</sup> in an experimental study of the *oxidation of sugar in pancreas diabetes*, found that the blood cells obtained from animals from which the pancreas had been removed destroyed the same amount of sugar as blood cells obtained from normal animals. Normal blood cells in the serum obtained from depancreatized animals used up no less sugar than normal blood cells in the serum of normal animals. The sugar used up by working muscle of pancreas-diabetic dogs (total pancreas diabetes in the sense of Minkowski) corresponds in amount throughout to the sugar used up by normal muscle.

Rolly and David<sup>3</sup> from experiments in which they determined *the respiratory quotient* in rabbits rendered glycogen-free through acid poisoning and in rabbits rendered glycogen-free through removal of the liver, conclude that diabetes is dependent upon an inability of the organism to use up carbohydrates, and that if, in a condition of severe diabetes, an increased production of sugar takes place, this abnormal

<sup>1</sup> British Medical Journal, September 19, 1914.

<sup>2</sup> Deut. Archiv f. klin. Med., 1914, cxv, 5 and 6.

<sup>3</sup> Münch. med. Woch., January 27, 1914.



sugar production is a secondary result of the carbohydrate hunger of the tissues.

Ringer showed that the administration of propionic acid to phlorizinized dogs is followed by elimination of "extra glucose," equal in amount to that capable of being formed from the propionic acid if all three carbon atoms are used in the formation of glucose. Greenwald<sup>1</sup> had the opportunity to test Ringer's findings on two diabetic patients. In the first experiment the extra glucose was almost exactly equivalent in amount to the propionic acid ingested. Later when the G : N ratio was lower, indicating an increased capacity for the oxidation of carbohydrates, the amount of glucose formed from the propionic acid administered was much diminished. In the patient whose utilization of carbohydrates was much greater, the excretion of glucose was much less as a result of the ingestion of propionic acid.

From the results of *the study of the formation of glucose from citric acid in diabetes mellitus and phlorizin-glycosuria*, Greenwald<sup>2</sup> thinks it quite evident that citric acid is capable of being quantitatively converted into glucose in the diabetic organism. It is, however, not necessary to assume that glucose is normally an intermediate product of catabolism of citric acid. It appears to be more probable that, at some stage in this process, one or more substances are formed which may, under proper conditions, give rise to glucose. In order to account for the quantitative conversion of the carbon atoms of citric acid into glucose, it seems to be necessary to assume that the molecule of citric acid, either before or after reduction, breaks down into three molecules of a compound or compounds containing only two carbon atoms which then recombine to form a straight 6-carbon chain.

In experiments carried out by Sansum and Woodyatt,<sup>3</sup> it was found that glycollic aldehyd given to phlorizinized dogs in single doses, of about 5 per cent. strength, subcutaneously, apparently caused an increased breakdown of protein, as evidenced by a rise in the urinary nitrogen and a corresponding increase of the sugar while G : N remained constant. The initial rise was followed in later periods by a fall in all the urinary components examined. When given very slowly in dilute 1 per cent. solution there was observed an absolute rise in the glucose excretion out of proportion to the rise in the nitrogen, hence an increased G : N ratio not due merely to a lessened nitrogen output but suggestive of a new formation of glucose out of glycollic aldehyd itself. Some 45 to 75 per cent. of the glycollic aldehyd given appears to have escaped oxidation and become converted into glucose in these latter experiments. Judgment is reserved as to whether the small increases of reducing

<sup>1</sup> Journal of Biological Chemistry, 1914, xvi.

<sup>2</sup> Jour. Biol. Chiur., 1914, xviii.

Journal of Biological Chemistry, May, 1914, xvii.

substances seen in these experiments are due to a conversion of glycollic aldehyd into glucose or to some other process.

In their studies of *the chemistry of glyconeogenesis*, Ringer and Fränkel<sup>1</sup> have adduced three important facts from their experiments: (1) that the administration of aldehydes to diabetic animals is followed by a very marked rise in the elimination of glucose; (2) that concomitant with this phenomenon there is a considerable drop in the elimination of acetone bodies; (3) that alcohols and acids related to the aldehydes do not possess these effects. They are led to conclude that acetaldehyd possesses the power of converting some substance in the animal metabolism that is non-glucogenetic to one that is glucogenetic; and that the substance so formed possesses a greater number of carbon atoms than does acetaldehyd.

Ringer<sup>2</sup> has investigated the *fate of pyruvic acid in metabolism*. In discussion, he says, "on correlating all the facts it becomes evident that pyruvic acid possesses its glucogenetic properties because acetaldehyd and lactic acid are formed in its intermediary metabolism. These two substances cannot possibly arise as a result of the same chemical process, and pyruvic acid must therefore be capable of following several paths of metabolism." The variable is not the pyruvic acid, but probably factors of equilibrium in the animal organism and he believes that there must exist a third possibility for the breakdown of pyruvic acid which results in no sugar formation. This would account for the very low sugar formation exemplified in two experiments of his series.

An ingenious *theory of diabetes*, with consideration of the probable mechanism of antiketogenesis and the cause of acidosis, is evolved by Ringer.<sup>3</sup> In preventing acidosis the author conceives the role of glucose in the normal individual to be such as to deviate the  $\beta$ -hydroxybutyric acid from its ordinary course of oxidation, by combining with it and thereby changing its structural configuration so as to give rise to non-acetone genetic products. Two factors seem to be necessary for the prevention of acidosis: (1) The presence of an abundance of carbohydrates in the diet to combine with all of the  $\beta$ -hydroxybutyric acid as it is produced in the intermediary metabolism of the fatty acids, leucin, tyrosin, etc. (2) The ability of the individual to accomplish the "glucosid union" with  $\beta$ -hydroxybutyric acid.

Ringer assumes that glucose acts antiketogenetically by forming a glucosid compound with  $\beta$ -hydroxybutyric acid. It seems reasonable to him to assume that since glucose and  $\beta$ -hydroxybutyric acid circulate in abundance in the blood of the diabetic, the immediate cause of acidosis may be due to the failure of that individual to accomplish this glucosid union. As  $\beta$ -hydroxybutyric acid arises in metabolism, it circulates in the blood as such, and becomes partly oxidized to aceto-acetic acid,

<sup>1</sup> Journal of Biological Chemistry, January, 1914, xvi.

<sup>2</sup> Ibid., March, 1914, xvii.

<sup>3</sup> Ibid., xvii.

which, in turn, is converted into acetone, all three substances being finally eliminated in the urine.

Ringer also believes that the failure of diabetics to form glycogen may be explained on exactly the same basis. In the formation of glycogen, a glucose molecule attaches itself to another glucose molecule, forming a glucose-glucosid or maltose.

This glucose-glucosid, with its free aldehyd radical, attaches itself to a similar molecule giving rise to a carbohydrate with four glucose components. This reaction goes on, constantly increasing the size of the molecule, until the glycogen stage is reached. The chemical characteristic of all of these unions is the same, namely "glucosid formation."

The failure to accomplish the glucosid union is at the bottom of all the chemical disturbances in diabetic individuals. The failure to form glycogen, with the consequent hyperglycemia, the failure to burn glucose, and the disturbance in the combustion of the lower fatty acids, can all be explained on the basis of this theory. This failure may come on gradually, affecting first the maltose and glycogen formation which becomes manifested by lowered sugar tolerance, hyperglycemia and alimentary glycosuria. As the disease progresses, the glycogen formation becomes more and more interfered with, until there is permanent glycosuria.

As long as enough glucosid-genetic function remains to cause the conjugation of all hydroxy-fatty acids as they arise in the intermediary metabolism of the fatty acids and of protein, so long will acidosis not come into evidence. When, however, this begins to fail, acidosis appears, and the diabetic enters on the "moderately severe" stage when even the sugar that originates from the metabolism of protein is not completely utilized. When the glucosid-genetic power of the individual fails completely, there ensues the most severe type of diabetes, which is associated with complete failure in sugar combustion, giving a D:N ratio of about 3.6 when on a fat protein diet, and a degree of acidosis which corresponds to almost the theoretical amount of  $\beta$ -hydroxy-butyric acid that can rise from the fat and protein metabolism.

**Pathology.** Stark<sup>1</sup> discusses the phenomenon of pathologic antagonism in its relation to diabetes mellitus. Stark defines pathologic antagonism as the tendency of a morbid process to come to a standstill or to disappear on the supervention of another morbid process. The cases considered are divided into three groups: (a) Those in which the glycosuria alternated with some other clinical symptoms; (b) those in which the diabetes disappeared on the establishment of some other disease; (c) cases in which a chronic glycosuria disappeared permanently after a surgical operation.

Group (a) An example of this group is the following: A chronic

<sup>1</sup> Medical Record, April 11, 1911.



glycosuria alternating twice in the same patient with urticaria, without any change of diet or medication. Another was a case in which a glycosuria alternated with the Wassermann reaction. Group (b) As examples are cited the cessation of diabetes after an acute pneumonia, typhoid, dysentery, scarlatina, and erysipelas. Group (c) concerns chronic glycosurias which disappear after a surgical operation. Examples are the following: The apparent cure of diabetes after an appendectomy, or after the drainage of the bile ducts. Also after extirpation of uterine and ovarian tumors, even of a malignant type.

In a study of the *pathologic anatomy of the pancreas*, Major<sup>1</sup> found, among the diabetic cases, 54 per cent. showing normal islands of Langerhans. Fibrosis of the islands of Langerhans was present in 46 per cent. of the cases, but no more marked than in non-diabetic cases. In 46 per cent. of the cases there was some hyalin degeneration of the islands of Langerhans. This degeneration in only one case involved a very large number of islands. All of the cases showing hyalin degeneration also presented some fibrosis, and *vice versa*. The hyalin degeneration in the diabetic series was the most striking lesion present, and was encountered in only one case of the non-diabetic series. All the lesions of the islands found in diabetic cases were also encountered, and in some to a more marked degree, in non-diabetics.

From his studies of *the pancreas in experimental diabetes* in the cat, Homans<sup>2</sup> concludes that the islands of Langerhans must be deeply concerned, for (a) the removal of more than three-quarters of the pancreas of the cat, leaving the main duct *in situ*, usually leads to a disappearance of secretory granules in the islands of Langerhans, with suggestive evidence of overactivity, without the production of diabetes, and (b) the same procedure occasionally causes a degeneration of the islands of Langerhans accompanied by fatal diabetes without disturbance of the remaining acinous tissue.

**Sugar Content of the Blood.** Contrary to Bang's recently expressed opinion, the observations of Epstein and Baehr<sup>3</sup> would seem to indicate that the hyperglycemia following simple bleeding is not merely psychic, but that it is a compensatory response on the part of the organism to keep the total blood-sugar up to a level commensurate with the needs of the tissues. In view of the diminished blood-volume, this is accomplished by an increase in the concentration. Similarly, if the total volume of fluid in circulation be not diminished, the blood withdrawn being immediately replaced by saline solution, the percentage concentration of the diluted blood rapidly rises (with occasional exceptions) to what it was before the experiment. In other words, the total sugar

<sup>1</sup> Journal of Medical Research, November, 1914.

Ibid., March, 1914.

Journal of Biological Chemistry, June, 1914, xviii.

in the circulation remains unchanged. It would seem, therefore, that, at least under such conditions as in the experiments cited, an increase in the percentage of sugar in the blood is only indicative of a relative, that is to say, percentile, but not of an absolute hyperglycemia.

The experiments suggest very strongly that glycosuria is the result of an absolute hyperglycemia and need not occur when the hyperglycemia is only relative. This would help explain the presence in certain individuals of glycosuria without hyperglycemia, and, conversely, the absence of glycosuria when hyperglycemia is present. The authors suggest the advisability of studying blood volumes and computing therefrom the total blood sugar in cases of diabetes mellitus, for therein may lie the explanation for the disproportion between the degree of hyperglycemia and the intensity of the glycosuria, which occurs so frequently in this condition.

Tachau<sup>1</sup> has studied *the distribution of sugar in the blood*. In fasting patients he found a higher sugar content in the plasma than in the whole blood, especially the corpuscles. At the height of alimentary hyperglycemia, the difference between the plasma and whole blood values in a series of cases was distinctly greater. The determination of the sugar-content of the blood corpuscles showed that in alimentary hyperglycemia, in the majority of cases, the content was raised. In some cases only did the sugar concentration in the blood corpuscles remain relatively less. In one case it decreased, while there was a distinct rise of sugar content in the whole blood. A certain time after the intake of carbohydrates there is found a return to a slighter concentration in the plasma than in the whole blood.

*New Methods for the Determination of the Sugar Content of the Blood* have been described by Dorner,<sup>2</sup> Roth,<sup>3</sup> Kraus,<sup>4</sup> Kamimura,<sup>5</sup> Autenrieth and Montigny,<sup>6</sup> and Epstein.<sup>7</sup> These methods are too long for description here. The reader is therefore referred to the original papers.

**Acidosis.** Sellards<sup>8</sup> described *a clinical method for studying the titratable alkalinity of the blood and its application to acidosis*. He gives the results of numerous experiments and of clinical studies in various diseases by means of this method. His results show that changes in the titratable alkalinity of the blood occur which give rise to distinct qualitative differences in the reaction of normal and pathological sera to phenolphthalein. Conditions may be obtained under which the blood serum,

<sup>1</sup> Zeitschr. f. klin. Med., 1914, lxxix, 5 and 6.

<sup>2</sup> Ibid., 1914, lxxix, 3 and 4.

<sup>3</sup> Deut. med. Woch., March 5, 1914.

<sup>4</sup> Lancet, May 2, 1914.

<sup>5</sup> Sei-I-Kivai, Tokyo, June, 1914, xxxiii, No. 6.

<sup>6</sup> Münch. Med. Woch., July 28, 1914.

<sup>7</sup> Journal of American Medical Association, November 7, 1914.

<sup>8</sup> Johns Hopkins Hospital Bulletin, April, 1914, xxv, 278.

during the acidosis, is neutral or acid, whereas under the same conditions all normal sera are strongly alkaline. The less severe grades of diminished alkalinity can be detected in a qualitative way from the behavior of sera before and after the removal of protein, and by the selection of a solvent, such as alcohol, in which the ionization and hydrolysis of carbonates are diminished. The effect of protein and of the solvent upon the reaction permit a variety of combinations of these factors for detecting varying grades of diminished alkalinity. Definite changes in titratable alkalinity occur in experimental and spontaneous acidosis in certain nephropathies and some anemias. The method also affords information of value in the differentiation of certain obscure comas. Cases of diabetes occur in which the excretion of ammonia, of acetone and of related bodies is normal, but the titratable alkalinity is decreased and the tolerance to bases is increased. This affords proof of a definite impoverishment in bases in these cases. Changes in the titratable alkalinity are accompanied by corresponding changes in the tolerance of the body to fixed bases. The titratable alkalinity is of important biological significance. While the available evidence indicates that the physico-chemical reaction of the blood is maintained at a fairly constant value, even in outspoken grades of acidosis, the parallelism between the diminution in titratable alkalinity and the increase in tolerance to fixed bases in diabetes and in the nephropathies affords crucial evidence that this increase in tolerance is due practically altogether to a deficit of the body in alkalies or alkali-yielding substances.

Sassa<sup>1</sup> had studied *the oxybutyric acid content of the organs in normal and diabetic individuals*. He found that the blood and the organs of man and of various mammals in the normal state always contained a slight amount of oxybutyric acid. The distribution of this acid in the organism is fairly uniform. Usually the different organs contain from 0.01 to 0.02 per cent. of this substance.

The output of acetone bodies, obtained through the regular administration of phlorizin to starved dogs, depends upon the intensity of individual factors, especially on the fat content of the animal and reaches its height usually on the second or third day of phlorizin administration. The organs of phlorizinized dogs killed at the height of acidosis often contain two or three times more oxybutyric acid than those of normal dogs, yet the amount of increased oxybutyric acid in the body, in comparison to the amount eliminated in the urine, is relatively slight. On the other hand, the increase of oxybutyric acid in the organs of men dead of diabetic coma is considerably greater. Here it can reach eight times the normal and the liver shows, relatively, the greatest increase.

The *behavior of acetoacetic acid, l- and dl-oxybutyric acids and butyric acid*, in the metabolism has been studied by Marriott<sup>2</sup> by means

<sup>1</sup> Biochemische Zeitschrift, 1914, lix.

<sup>2</sup> Journal of Biological Chemistry, July, xviii, No. 2.



of incubation experiments on hashed organs, and by parenteral introduction into normal and phlorizinized dogs and young pigs. The analytical results obtained from individual organs, the circulating blood, and the urines have led to the following conclusions: (1) Acetoacetic acid can be readily converted into dl-oxybutyric acid in the organism, but the reverse change is difficult, and probably not accomplished under normal conditions. (2) The dextro component of dl-oxybutyric acid can be utilized, even by the diabetic organism, and this is the explanation of the appearance only of l-oxybutyric acid in diabetic urines. (3) The normal path of fatty acid catabolism is as follows: Fatty acid (butyric acid?)—acetoacetic acid—d-oxybutyric acid (readily burned) l-oxybutyric acid (difficultly burned).

Fridericia<sup>1</sup> describes *a method for estimating the degree of diabetic acidosis* by determining the carbon dioxid tension in the air of the lungs, Steensman and Koopman<sup>2</sup> describe *a simple test for diacetic acid in the urine* and the determination of the degree of acidosis in diabetes, and Folin and Denis<sup>3</sup> have devised *turbidity methods for the quantitative determination of acetone, diacetic acid, and  $\beta$ -oxybutyric acid in the urine*.

Czapski<sup>4</sup> reports an interesting case of the most extreme acidosis occurring in the course of diabetes mellitus. In addition to the unusual degree of the acidosis, this case showed further important changes in the metabolism. Free oxybutyric acid was found in the urine, and there occurred a toxogenic breakdown of protein. The case exhibited two periods of extreme acidosis. During the first period, on four successive days the output of oxybutyric acid in the urine ranged from 76.3 grams to 91.8 grams. During the second period extending over ten days, the total output in the urine of oxybutyric acid and diacetic acid reached the enormous total of 1085.5 grams. It was during the second period of extreme acidosis that the patient developed the toxogenic protein breakdown. In nine days the loss of nitrogen amounted to 75.8 grams, or an average of 8.5 grams a day.

**Treatment.**—A series of investigations has been carried out by Klercher<sup>5</sup> on *the action of the opium alkaloids upon certain hyperglycemias*. His results show that upon those hyperglycemias produced by either the injection of adrenalin or "piqûre," no positive action of the opium alkaloids could be demonstrated. On the other hand, alimentary hyperglycemia after the administration of glucose could be more or less reduced after the use of the opium alkaloids. When the tincture of opium was used, this restrictive action in general was brought about only after the administration of such doses as caused an increase in the

<sup>1</sup> Zeit. für klin. Med., 1914, lxxx, 1 and 2.

<sup>2</sup> Nederlandsch Tijdschrift voor Geneeskunde, 1914, lviii, No. 11.

<sup>3</sup> Journal Biological Chemistry, July, 1914.

<sup>4</sup> Archiv. Exper. Path. u. Pharmacologie, 1914, lxxvii, 3 and 4.

<sup>5</sup> Biochem. Ztschr., 1914, lxii.

blood sugar. It is very probable that the restrictive action of these alkaloids of opium is a result of their well-demonstrated retarding influence upon the excretory mechanism of the ventricle.

Lewis and Fränkel<sup>1</sup> have studied *the influence of inulin on the elimination of glucose*. They found that when inulin is administered to phlorizinized dogs, it does not give rise to glucose. The feeding of levulose to the same animals results in the elimination of large amounts of glucose. Since levulose administered to phlorizinized dogs is largely excreted as glucose and not burned, there seems little probability that an appreciable amount of inulin is converted to levulose or to any substance that can give rise to glucose in the diabetic organism.

An important study of diabetes, experimental and clinical, has been made by Allen.<sup>2</sup> On the basis of his experiments he makes the following statements:

After removal of sufficiently large fractions of the pancreas, dogs develop a severe diabetes, in which they show heavy glycosuria on meat diet and also during considerable periods of fasting. The condition progresses steadily downward to a fatal end.

When the remnant of pancreas left *in situ* is slightly larger, a condition may be produced in which the fate depends upon the diet. On meat feeding, such a dog is free from glycosuria and remains so for months, eating his fill every day and maintaining full health and nutrition, with no sign of downward progress; but subcutaneous tests show that the dextrose tolerance is very low, and bread feeding readily produces glycosuria. A return to meat diet stops the glycosuria; but if the bread diet and accompanying glycosuria are maintained for too long a time, the glycosuria then continues, even on meat feeding. The diabetes thus produced is not inferior in severity to that resulting from simple removal of larger fractions of pancreatic tissue, and the downward course and fatal termination are similar.

When the pancreas-remnant is still larger, glycosuria is absent on meat diet, and on bread diet may be absent or transitory. Such animals may remain in excellent condition indefinitely on bread diet, free from glycosuria or any downward tendency; but if sufficient sugar is added to the diet, glycosuria can be produced and maintained. After a period of such glycosuria, the animal reaches a condition in which it has glycosuria on bread diet. By prolonging the glycosuria on bread diet, the dog finally reaches the condition of severe diabetes, with glycosuria on meat diet, and continuous downward progress. For such sugar feeding, Allen has ordinarily used commercial glucose. The experiments succeed best in greedy dogs and those naturally fond of sugar. A decided aversion to sugar on the part of the dog may spoil such an attempt through failure of appetite.

<sup>1</sup> Journal of Biol-Chem., 1914, xvii.

<sup>2</sup> Journal of American Medical Association, September 12, 1914.

When the pancreas-remnant is still larger, sugar feeding may produce transitory glycosuria, but it cannot be made to continue. The sugar tolerance is lower than in normal dogs, but nevertheless the doses of sugar necessary to produce glycosuria are higher than can be tolerated as a daily routine by the gastro-intestinal canal. Persistence in the attempt to maintain glycosuria causes diarrhea and illness. The dog refuses to eat, sugar given by a stomach tube is vomited, and true diabetes remains absent. Similar results can be obtained with cats by feeding carbohydrate in the form of milk.

It was thought justifiable to undertake the treatment of a limited number of patients by a method based on the principle derived from the experimental work as indicated. The number of patients so far treated is limited, but the results obtained indicate that the same method employed in rendering the diabetic dog free of glycosuria and prolonging its life is efficacious in eliminating glycosuria and acidosis in the human patient. To what extent life may be prolonged by this method only a large statistical study will show. The observations so far indicate that the method is not harmful, and, when carried out carefully, seems definitely beneficial.

The method of treatment is, in brief, as follows: If the patient is moderately emaciated, with a negative carbohydrate balance and acidosis, he is put to bed and receives no food whatever. If coma seems imminent, the usual emergency treatment with purging, stimulants, alkalies and large amounts of water should, of course, be carried out. In addition to fasting, alcohol is important in the treatment at this stage. From 50 to 250 c.c. of whisky or brandy may be given in each twenty-four hours in small doses, from 10 to 20 c.c. every one to three hours during the twenty-four. As soon as the glycosuria stops and the acidosis diminishes, which, even in severe cases, may be within forty-eight to ninety-six hours, the amount of alcohol and alkali may be reduced. Fasting and moderate dosage of alcohol are continued for from twenty-four to forty-eight hours longer, however, depending upon the patient's strength. The alkali is now stopped, and feeding with starch is commenced in order to clear up the last traces of ketonuria. The kind of starch is of minor importance. Green vegetables are useful because their carbohydrate and food value is so low that they can be given in considerable bulk, and this bulk is agreeable to the patient for relieving his feeling of emptiness. Neither fat nor protein is added. For the first day the food is chosen to represent a carbohydrate content of from 10 to 40 gm. This is divided into four to ten equal portions and fed at equal intervals during the day. If glycosuria remains absent, the ration for the next day is doubled, to represent 20 to 80 gm. of carbohydrate, similarly divided into numerous small portions. On the next day it is sometimes possible to increase the ration to 100 gm. of carbohydrate, without glycosuria. About this time, especially if



glycosuria has appeared, another fast-day is interposed, from 50 to 200 c.c. of whisky being given. Present experience indicates that, even in severe cases, ketonuria may by this method be made to disappear entirely. Several repetitions of the foregoing routine may be necessary for this purpose. All food contains danger, tending toward either glycosuria or ketonuria. The carbohydrate of the diet is seldom reduced below 50 gm. and is preferably kept higher. If carbohydrate must be kept low, the total diet is kept low. The diet is so chosen that glycosuria, not ketonuria, is the signal of overstrain. Fasting-alcohol days are given not merely whenever this signal appears, but also at close enough intervals to prevent it from appearing, even every two or three days, if necessary. If there has been no glycosuria, a slight addition to the diet is made after each fast-day. Each day's diet is calculated exactly, and the nitrogen-balance is watched. It is thought that no matter how low the assimilative power, the attempt to feed in excess of this power is harmful, and it is possible that by rest the assimilative function may gradually become stronger. With improvement in the patient's condition, the carbohydrate in the diet is further increased. Increase in weight, however, is not attempted at this time. From our present point of view, contrary to the generally held opinions, the attempt to increase weight should be the last rather than the first step in treatment. It is attempted to keep the metabolism at the lowest safe level until the patient is taking from 100 to 150 gm. of carbohydrate (mostly as green vegetables) daily, with fast days interposed often enough to prevent any trace of glycosuria from appearing. Then protein is cautiously added, always being kept rather low; and in favorable cases the weight and well-being may finally improve under gradual additions of fat.

The radical procedure here described is that used for the most severe cases. In milder cases the treatment may be correspondingly milder. Primary loss of weight is intentional. The purpose of the treatment is not to confer temporary comfort or appearance of well-being, though various symptoms, including polyphagia and asthenia, may actually be relieved. When there is extreme cachexia and emaciation, the difficulty is greatest. It may then be necessary to juggle very carefully the three factors of glycosuria, acidosis, and nutrition.

A report giving the results of this form of treatment in a series of cases will be published later. It is felt that the conception underlying this method of treatment, based on experimental observations, is new, though certain details have long been recognized as of importance. According to this method, alkali treatment is not employed, unless for a brief period at the outset, while severe acidosis is being combated. The alkali treatment has been called the most brilliant discovery in the modern study of diabetic therapy. It is indeed a valuable means for facilitating the excretion of acetone bodies. But under an efficient treatment of diabetes, acetone bodies should not be excreted. They should be burned.

Though it seems possible thus to check all active symptoms, with apparent benefit, even in very severe cases, yet it is felt that the ultimate outlook for these patients is far less favorable than it would be if they could be treated earlier. The best therapeutic hope is believed to lie in the application of this principle of treatment at the earliest possible stage in diabetes.

Cambridge<sup>1</sup> says that the first essential in the treatment of all cases of glycosuria is that the diet should be adjusted as accurately as possible to the metabolic powers of the patient, so that while sufficient food is taken and absorbed to meet the requirements of the body, all unnecessary strain on the defective functions is avoided. Each patient is a law unto himself, as to the kind and quantity of food that can efficiently be dealt with and is best tolerated. One cannot argue from one case to another, or lay down rules that will be generally applicable. Diabetes is essentially a disturbance of the chemistry of the body, in which metabolism of carbohydrates, fats and proteins may all be involved, and, to treat patients satisfactorily, one must ascertain their powers of dealing with each of these substances. The earlier in the course of the disease the treatment can be commenced, the easier will be the task and the more satisfactory the results.

Wilenko<sup>2</sup> has carried out investigations which show the *value of alkali in the treatment of diabetes*. He found that glycolysis in the blood and in the organs is restricted when the blood becomes even a trifle less alkaline than normal. Glycolysis in the test-tubes is totally arrested by an increase in acidity of the medium from  $\frac{0.1}{1000000}$  to  $\frac{0.2}{1000000}$ . The already impaired glycolysis in the diabetic suffers particularly from any change in the physiologic reaction, and recent tests of the carbon dioxid tension of the blood have confirmed the acidification of the organism in diabetes, and emphasizes the necessity for restoring the balance by administration of an alkali without waiting for coma to develop. This is especially necessary on account of the acidity-promoting influence of the measures we enforce on diabetics, the preponderance of meat and the elimination of carbohydrates from the diet, all tending to increase acidity. Even when there are no signs of acetonuria, an alkali should be given when the carbon dioxid tension in the blood shows abnormal acidity. An alkali, he further insists, should be given systematically when we have to regulate the diet to exclude carbohydrates and include much meat. When this is done, acetonuria is warded off. There is nothing to show that the alkali acts on the cause of the diabetes; its effect is merely symptomatic, but as such it wards off or neutralizes acidosis with all its evil consequences.

Wolf and Gutmann<sup>3</sup> have studied thirty-five cases of diabetes, six of

<sup>1</sup> Practitioner, London, May, 1914, xcii, No. 5.

<sup>2</sup> Med. Klinik, June 14, 1914.

<sup>3</sup> Zeitschr. f. klin. Med., 1914, lxxix, 5 and 6.

which were associated with chronic nephritis. They found that on a diet free from carbohydrates the proportion of sugar in the blood was markedly decreased in the twenty-nine cases not complicated by kidney disease. Four patients with the mildest form of diabetes had the sugar content of the blood reduced to within normal range in this way. When carbohydrates were ingested, the sugar content in the blood increased, and the more rapidly and with the greater intensity the severer the diabetes. When the sugar level peculiar to the case had been reached, no restriction of albumen (by vegetable-fat days) affected the sugar content, not even when the amount of sugar in the urine was remarkably reduced or the urine quite clear of sugar. Oatmeal days tended rather to increase the sugar content of the blood, if they affected it at all. The six diabetics with chronic kidney disease always had an excess of sugar in the blood although their glycosuria was slight and could be banished by diet.

Labbe<sup>1</sup> makes the statement that diabetics sometimes are unable to digest oatmeal. Even at the best, it is a food poor in albumen and nitrogen. He has found that diabetic patients thrive much better on a three-day course of a dry vegetable diet. They digest it readily; it is eaten with greater appetite, and does not have a constipating effect like milk, or induce diarrhea like the oatmeal. The ration is 300 gm. of legumes with 150 gm. of butter, three to six eggs, and three to six rolls made from antidiabetic flour. He permits three or four glasses of Bordeaux wine and some green vegetables, but no meat. Besides peas, beans and lentils, the soy bean might be utilized, although this is difficult to cook. Some of the patients follow this diet for a week at a time or longer. The benefit is particularly marked in severe forms of diabetes, the glycosuria, the acidosis, and the nitrogen balance all showing improvement.

Raulston and Woodwyatt<sup>2</sup> report a case of diabetes of six years' standing in a man, aged thirty-four years, which they treated dietetically and by the transfusion of 500 c.c. peripheral venous blood from a healthy donor (the patient's brother). In the five days prior to the transfusion the patient excreted 132.1 grams of glucose as against 244.1 grams for the five days following transfusion, a difference for five days of 112 grams. The maximum quantity of sugar derivable from the protein and sugar of the perfused blood was 3.65 times 15.6 plus 0.5 or 57.4 grams, provided all the protein was broken down as it is in the severest diabetes. This would account for less than half the extra sugar which appeared during the second five days. Although 15.6 grams of nitrogen were introduced, the aggregate increase in nitrogen for the five days following the transfusion was 11 grams. This is explainable by the facts that the patient had been in a nitrogen deficit for ten days before

<sup>1</sup> Bulletin de l'Académie de Médecine, January 13, 1914.

<sup>2</sup> Journal of American Medical Association, March 28, 1914.



the transfusion and that the nitrogen in the urine was still above that of the diet when observations were stopped. The ammonium, the acetone bodies and the diabetic quotient all arose. In short, the diabetes was rendered more severe in every respect. There was no evidence that an increase in the utilization of sugar actually occurred and was simply masked by the increased quantity of sugar from the protein administered. They conclude that, in severe diabetes mellitus, blood transfusion is definitely contra-indicated.

### GOUT.

The writings of the year on gout have been exceedingly limited, and nothing of note that is new has been brought to light.

Brusch and Kristeller<sup>1</sup> have devised a simple and rapid method for *the quantitative estimation of uric acid in the blood*. Fifteen to 20 drops of the blood (equals 1 c.c.) is taken up in a small open tube, and, after standing for two or three hours,  $\frac{1}{10}$  c.c. of the clear serum is taken up by a pipette and deposited in a beaker. To this serum is added 2 c.c. of 7.5 per cent. sodium carbonate solution and 0.4 c.c. of a phosphotungstic acid solution prepared according to the manner of Folin (100 grams of sodium tungstate, 80 c.c. of 85 per cent. phosphoric acid, 700 c.c. of water, heated for several hours and diluted to 1 liter). Upon shaking, a weaker or stronger blue color, depending upon the content of uric acid and absolutely parallel with the concentration of uric acid, appears. This blue color is then compared with an empiric scale somewhat similar to the Tallqvist hemoglobin scale and one can easily read off the content of uric acid in milligrams per 100 c.c.

Autenrieth and Funk,<sup>2</sup> from their researches, found that normal human blood contains from 1 to 3 mg. of uric acid per 100 c.c. The blood of bees and swine contains about the same proportion. In gout, however, the content of uric acid, in one case, they found to run up to 5 mg. per 100 c.c. of blood.

Kocher<sup>3</sup> has studied the uric acid content of the blood and its value in diagnosis. He found increased values for the uric acid content in three different groups of cases: (1) In cases showing severe kidney changes associated with increase of blood-pressure in whom, in addition to other urinary conditions, there was exhibited retention of uric acid. Cases of uremia showed the highest uric acid content in the blood; (2) in cases of gout where a specific increase of the uric acid occurs; (3) in all conditions accompanied by an increased cell destruction, as in leukemia, pneumonia, carcinoma and cases of fever, where the heightened content of uric acid is of the same significance as that which

<sup>1</sup> Deut. med. Woch., April 9, 1914.

<sup>2</sup> Munch. med. Woch., March 3, 1914.

<sup>3</sup> Deut. Archiv f. klin. Med., 1914, cxv, 3 and 4.

takes place after the administration of exogenous nuclein. In differential diagnosis the determination of the uric acid content of the blood serves to separate chronic arthritides, not of a gouty nature, and the group of deforming arthropathies from those joint affections which are gouty in nature. The diagnosis is rendered more difficult when an infectious arthritis occurs associated with high fever, for here we have increased cell destruction giving rise to an increased uric acid content of the blood. In many cases a determination of this kind will differentiate between a simple nephritis and a kidney insufficiency of gouty origin.

Taylor and Rose<sup>1</sup> have experimentally studied the influence of protein intake upon the formation of uric acid. The subject was a healthy man whose metabolism had often been studied and whose endogenous purin-nitrogen was known to run from 0.075 to 0.1 grams. The experiment was divided into two periods. In the first period of four days, the subject subsisted upon a practically nitrogen-free diet of purified starch and cane sugar having a heat value of 2200 calories. During the second period of four days the man ingested as heavily as possible whites of eggs (over 40 grams of nitrogen) and sugar was added to this diet to bring the intake of calories up to a level with that of the first period. They found that the output of uric acid was nearly three times as large upon the heavy purin-free protein diet as upon the protein-free diet. The authors think it possible, since nucleic acid is synthesized directly or indirectly from components of protein, that, when the body is flooded with amino-acids, nucleic anabolism and catabolism are exaggerated—an application of the law of mass action. It is also possible to interpret the increased output of uric acid merely as the expression of over-work, the result of excessive activity of glandular cells in the digestion, assimilation, and catabolism of the unusual intake of protein.

Goldscheider<sup>2</sup> discusses *atypical gout* and the related metabolic disturbances. He defines atypical gout to be that which occurs in those cases where one finds gouty deposits without the occurrence of the typical acute gouty attacks. The occurrence of this form of gout, according to the author, is extraordinarily frequent. During the years 1912 and 1913, he observed 271 cases. The known associated symptoms of the condition occurred with the following frequency in his series: Obesity in 37.4 per cent. of the cases; enlargement of the liver without obesity in 14.7 per cent.; nervous symptoms in 41.7 per cent.; cardiovascular symptoms (including renal) in 44.8 per cent.; renal symptoms 13.8 per cent. Different combinations of these symptoms occurred. The simplest form of the disease is expressed in those cases where the patients complain of joint or muscle pain occurring either chronically or at times without any apparent changes in the joints. Generally,

<sup>1</sup> Journal of Biological Chemistry, 1914, xviii.

<sup>2</sup> Berliner klin. Woch., July 13, 20, 1914.

however, a grating sound can be elicited but this may also fail of appearance. The pain is dependent upon the weather, the effects of cold, diet, and intestinal function, and is associated with a feeling of stiffness, especially in the morning. These cases are usually looked upon as rheumatism and only upon the finding of invisible tophi can one recognize the gouty character of the condition. The author calls attention to the greater relative frequency of this condition in females. Of the 271 cases, 171 occurred in men and 100 occurred in women; while in 67 cases of typical gout, 55 were men and 12 women. The importance of the subject lies in the unrecognized or overlooked fact that a number of symptoms on the part of the nervous and circulatory systems and the kidneys are the result of metabolic disturbances analogous to, or identical with, those of gout. These may be due to an inherited tendency, to overwork, or to lack of exercise. Treatment of the metabolic disturbances applied in time and systematically is liable to give highly gratifying results.

It seems plausible to the author to assume that symptoms on the part of the cardiovascular system, nerves, etc., in these cases are due to deranged or insufficient metabolism of purins or to excessive intake of purins beyond what can be properly metabolized, or to the inherited tendency underlying the constitutional obesity, or to an upset in the liver control of metabolism. Goldscheider emphasizes the importance of a deranged metabolism as a factor in cardiovascular, nervous, and renal phenomena. The only proof he has to offer for some of his statements is the success of treatment based thereon.

Steinitz<sup>1</sup> has studied the blood with reference to its uric acid content in atypical gout. From these studies he recognizes a neutral zone in the uric acid content for both typical gout and atypical gout. For the former, this neutral zone runs from 3 milligrams per 100 c.c. of blood to 4 milligrams, and for atypical gout from 2.5 milligrams to 4 milligrams inclusive. Uric acid values in the lower half of the neutral zone speak with fair surety against gout. Values in the middle of the neutral zone speak with greater probability for gout the nearer they approach the upper borders, while values found in the upper half of the neutral zone point almost surely to gout.

Chace and Fine<sup>2</sup> review their experience with *the use of atophan and radium emanation in the treatment of gout and the arthritides*. Under treatment with atophan, five cases of gout showed improvement of more or less permanence, as did also four cases of possibly gouty nature. Of eleven cases of arthritis of various types, two showed some improvement. A superficial summary of clinical results of this character cannot, however, convey an adequate view concerning the value of the treatment. Thus, in one case of gout, there was almost immediate improve-

<sup>1</sup> Berliner klin. Woch., July 13, 1914.

<sup>2</sup> Journal of American Medical Association, September 12, 1914.



ment after taking atophan, which persisted even after the cessation of the use of the drug, and in spite of the return of the uric acid concentration of the blood to the original level; while in another case of gout, the initial improvement became less pronounced in spite of the continued use of atophan and the maintaining of the blood uric acid at less than half its original level.

They have treated thirteen cases of gout and arthritis in an emanatorium with *radium emanation* of 0.5 to 150 Mache units per liter of air in one to two hours sitting for one to two months; two cases of arthritis with radium drinking-water; and five cases of arthritis with injections of radium bromid, equivalent to 50 to 100 micrograms of the element. In no instance was there any change whatever in the uric acid concentration of the blood. In view of these findings, they could not subscribe Gudzent's claim that with concentrations of radium emanation of as little as 2 to 4 Mache units per liter, uric acid disappeared from the blood and remained absent as long as one year.

With regard to clinical effects, they say that in only two instances—those in which radium solutions were injected—did there appear to be any improvement. Here again, however, they felt that the treatment should be extended over a greater interval before conclusions could be properly drawn with regard to clinical results.

### SCURVY.

Little has appeared on this condition in the literature of the year. A study of *the cause of the bleeding in infantile scurvy*, including a consideration of the clotting power of the blood, forms the nucleus of an investigation made by Hess and Fish<sup>1</sup> on infantile scurvy. For the coagulation tests, blood was aspirated directly from the bloodvessels and oxalated. This plasma showed a slight diminution in clotting-power. This defect did not seem, however, to be the result of an insufficiency of calcium. The antithrombin was not increased. Small amounts of blood were also obtained by puncture of the finger. Examinations of this blood revealed a normal number of blood platelets. In other respects the picture was that of a simple secondary anemia, except that the hemoglobin was diminished out of proportion to the red blood-cells. A marked regeneration of these cells during convalescence, leading to a polycythemia, was also noticed.

These various departures from the norm, according to the authors, are sufficient to account for the hemorrhage associated with the disease. The integrity of the bloodvessels was therefore investigated. The vessels of normal infants were found to withstand, without apparent disturbance, 90 degrees of pressure for three minutes, whereas the vessels

<sup>1</sup> American Journal of Diseases of Children, December, 1914, v 111.

of infants suffering from scurvy gave way under this pressure. Numerous petechial hemorrhages of the skin or mucous membranes were frequently noted as one of the earliest signs of the disease. The well-known "exudative diathesis" of Czerny was found definitely to predispose to the development of scurvy.

Several cases of scurvy developed in infants who were being fed on milk which was pasteurized at 145° F. for thirty minutes. They were cured by receiving fruit-juice or raw milk. Orange-juice was found not to lose its efficacy, as the result of being boiled ten minutes. The juice of the peel was successfully substituted as an antiscorbutic for the juice of the orange. Potato proved to be an excellent antiscorbutic. It is suggested that it be added to pasteurized milk as potato-water instead of the barley-water which is now commonly used as a diluent. In this way the necessity will be obviated of giving orange-juice. Cod-liver oil or olive oil, although given for weeks, did not prevent the development of scurvy.

Darling<sup>1</sup> had favorable opportunities for making a study of scurvy while visiting South Africa and Rhodesia. He performed a number of postmortem examinations, and collected some pathological material. At the first necropsy he was struck by the remarkable appearance of the heart, for it suggested at once the pictures seen in a well-marked case of right-sided hypertrophy and dilatation in beriberi. On his return, he examined microscopically the vagus and its branches, as well as the heart muscle, in some of the cases and found degenerative changes of the same type seen in beriberi. Each necropsy presented the same cardiac lesion, and, following up the observations, a number of clinical, pathologic, and epidemiologic observations were made which show family relationships between scurvy, a classical example of a food deficiency cachexia, and beriberi, and also, as Watkins-Pitchford pointed out in 1912, with certain members of the group of dietetic cachexias. At one extreme is rickets, a type of pure osteo-cachexia. At the other extreme, a pure neuro-cachexia, such as the polyneuritis gallinarum of Eijkman. Between these two types are scurvy, infantile scurvy, the experimental scurvy of guinea-pigs, ship beriberi, beriberi (two or more types), infantile beriberi, and epidemic dropsy and neuritis.

Stepp<sup>2</sup> has studied *the relationship of a lipoid-free diet to beriberi and scorbutus*. He discusses the relations of these two diseases, and gives the details of his experiments. He found that mice which were fed on a diet from which the alcohol-ether extractives had been removed gradually lost weight and died in the course of three or four weeks. Outside of general body weakness and loss of weight, no special symptoms were noted. The weakness of the hind extremities, observed in many of the cases, was probably merely an expression of the general weakness.

<sup>1</sup> Journal of American Medical Association, October 10, 1914.

<sup>2</sup> Deut. med. Woch., April 30, 1914.

If to this diet an alcohol-ether extract of egg yolk was added, the mice survived. If pure fat was added to this diet, it had no influence on the fate of the mice. Different combinations of lipoids, such as lecithin, cholesterin, zerebroside, lesithol, kephalin, and phytin were added to the extractive-free diet without effect. He concludes that probably a vitamin plus certain lipoids are necessary to life.

Freise<sup>1</sup> relates a typical, severe case of Barlow's disease which was cured through the administration of an alcoholic extract of the common beet. The case occurred in a child eleven months old, and the cure was attained in seven weeks through the administration of a total of 13.79 grams of the alcoholic extract. The dried extract was given in the form of an emulsion in water. Two c.c. of the extract in 100 c.c. of water were given through the day with the addition of a few drops of normal hydrochloric acid. Röntgenograms taken at different times through the course of the cure showed extensive repair taking place in the affected bones. He looks upon this remedy, which up to the present time is the most concentrated solution of anti-scorbutic substance, as the rational etiotropic therapy for the disease.

Ashburn and Schmitter,<sup>2</sup> from their experiments, found that, for the prevention of scorbutic symptoms in guinea-pigs, yeast, live or killed by heat, had no preventive value. Mongo beans have a slight preventive value. Fresh mongo sprouts, boiled mongo sprouts, canned tomatoes and canned sauerkraut are efficient preventives and of approximately equal value, and canned cabbage is definitely more efficient than any of the above named. From clinical experience and the similarity of the disease, the authors think it is reasonable to believe that these findings would apply also in the prevention of human scurvy. Schmitter<sup>3</sup> found that boiling canned cabbage for one hour does not decrease its antiscorbutic efficiency as observed in guinea-pigs.

<sup>1</sup> *Monatsschrift für Kinderheilkunde*, 1914, xii.

<sup>2</sup> *Military Surgeon*, September, 1914.

<sup>3</sup> *Ibid.*



# OPHTHALMOLOGY.

By EDWARD JACKSON, M.D.

**Examination of the Angle of the Anterior Chamber.** The appearances of the iris and contents of the anterior chamber are so easily observed by oblique illumination that few realize that it is impossible to see the extreme angle of the anterior chamber back of the scleral margin in this way. A foreign body in the anterior chamber slipping entirely out of sight may lead one to think that it has passed into the deeper parts of the eye, when it has only dropped back into the angle where it is completely hidden. Salzmann<sup>1</sup> has pointed out that the periphery of the anterior chamber can be examined by indirect ophthalmoscopy. The nasal portion is most readily brought into view. The eye being strongly converged, the observer throws the light upon it in a direction at right angles to the visual axis.

From near this position, a curved, white reflex appears in the cornea. This comes from the sclera in the direction of Schlemm's canal. On slightly varying the position of the light there comes into view the extreme angle of the anterior chamber; and the anterior surface of the iris greatly foreshortened. The iris surface is recognized by its color and irregularities; and, between it and the sclera, a light streak indicates the anterior edge of the ciliary body. From the iris a delicate fringe, or more pronounced projections, extend toward the sclera. Peripheral anterior synechiæ may thus be discovered and examined. The examination is most readily made and most satisfactory in eyes with a large prominent cornea, and deep anterior chamber.

Because of the extreme hyperopia of the anterior chamber, the convex object lens must be stronger or held farther from the eye than for the ordinary ophthalmoscopic examination by the indirect method. It should also be tilted to correct the astigmatism caused by looking so obliquely through the cornea.

**Study of the Small Vessels at the Corneal Limbus.** Through the ophthalmoscope many observations of general importance have been made on the minute vessels of the retina. The vessels of the corneo-scleral margin are almost equally accessible to observation. And, with the corneal microscope capable of magnifying 10 diameters and upward, changes in these vessels of equal general importance should be observable. Streiff<sup>2</sup> reports the results of his studies in this field.

<sup>1</sup> Zeitschrift f. Augenheilkunde, January, 1914, vol. xxxi, p. 1.

<sup>2</sup> Klinische Monats. f. Augenh., September, 1914, vol. liii, p. 395.

He calls attention to the movement of the blood in the peripheral anastomosing vessels, to aneurysmal dilatations and varicosities in some of them, and to evidences of arteriosclerosis.

**Tests of Visual Acuity.** It is now five years since the International Ophthalmological Congress at Naples adopted the broken ring of Landolt as the best international standard of visual acuity. Wolffberg<sup>1</sup> raises the question whether this was a wise decision, and doubts if any advantage has come of it. Doubtless the test has been very little used in practical work, because no attempt has been made to employ it as cards of test letters are used; and, for the subjective determination of ametropia, it is quite inferior to the test letters.

But Jackson<sup>2</sup> has pointed out that if the broken ring be arranged in a symmetrical group (see Fig. 100) and printed on a square card that can be turned with either side uppermost, it constitutes an absolutely unlearnable test that is most convenient for testing the acuteness of vision of large numbers of persons. The test is placed five meters from the person to be tested, the distance being laid off in one-half meters.

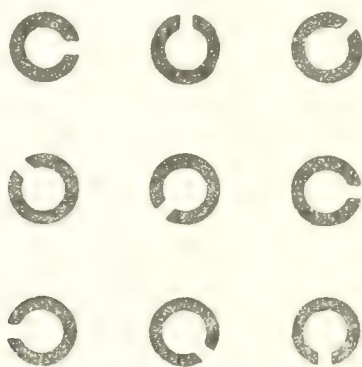


FIG. 100

If the direction of the break in the ring is recognized at full distance, full acuteness of vision is shown. If the break is not recognized at five meters the eye is brought nearer the test until it is perceived, each half meter representing a diminution of one-tenth in visual acuity.

The International Test should also be used to *standardize the cards of test letters* employed in measuring refraction, and a Committee of the Section on Ophthalmology of the American Medical Association has been appointed to do this for the test cards in most common use. By numbering each line of letters by the vision it represents according to the International Standard, it would be easy to get records of visual acuity having a definite and permanent value.

**Field of Vision.** It has been common to map out the field of vision with a test object 10 mm. on a side. As pointed out by Traquair,<sup>3</sup>

<sup>1</sup> Woch. f. Therap. u. Hyg. d. Auges., vol. xvii, p. 201.

<sup>2</sup> Journal of American Medical Association, August 29, 1914, vol. lxiii, p. 718.

Ophthalmic Review, March, 1914, vol. xxxiii, p. 65.

this is unnecessarily large; and, with it, moderate impairment of the visual field may wholly escape detection. A square 5 mm. on a side is quite large enough; and one 3 mm. on a side, when used in a good light, will give almost the same normal limits to the field as the larger ones. For slight changes in the central portion of the field, test objects 1 or 2 mm. in diameter must be used. Traquair believes that tests of the fields for colors show the same conditions as tests with a smaller white object on a black field.

**Local Anesthesia for Operations.** When it was found that the anesthetic effect of cocain instillations was quite superficial, and injections of large amounts of the drug into the tissues might be dangerous, many operations upon the eye, especially those done on inflamed eyes, were held to render necessary a general anesthetic. Recently, with the introduction of alpin and novocain, and the increase of anesthetic effect gained by adding to their solutions a little adrenalin, many operators have begun to do operations, even enucleation, on inflamed eyes, with very satisfactory results.

Pooley<sup>1</sup> uses a solution:

Alpin . . . . .	1.0
Sodium chlorid . . . . .	0.8
Solution of adrenalin chlorid (1:1000) . . . . .	1.0
Distilled water . . . . .	100.0

Of this, from 15 to 60 minims may be injected. He begins by injecting 3 or 4 minims behind the outer canthus. Then, from this region, the needle is thrust above and below the external rectus muscle, just behind the posterior pole of the eye; and the remainder of the amount injected, 15 or 30 minims for a non-inflammatory case, and 30 to 60 minims if the eye is inflamed. By this method he has obtained practically complete anesthesia for operations like cataract, iridectomy, magnet extraction of steel, and evisceration of the eyeball.

Taylor<sup>2</sup> has used the method for enucleation with great satisfaction. He injected novocain, which is also preferred by Reinflet,<sup>3</sup> who uses a 1 per cent. solution of novocain in sterilized physiologic serum, to which is added solution of adrenalin, 1 to 1000, 1 part to 60 of the novocain solution. The solution must not be heated after the adrenalin is added. In using this method of local anesthesia, an interval of from thirty to forty-five minutes should elapse after the injection of the anesthetic before attempting the operation.

**Ambidexterity.** Many ophthalmic surgeons always do cataract extraction, iridectomy, etc., standing at the head of the patient making the incision with the right hand for the right eye, and the left hand for the left eye. Others believe a higher degree of mechanical skill is

<sup>1</sup> Ophthalmoscope, August, 1914, vol. xii, p. 464.

<sup>2</sup> Ibid., October, 1914, vol. xii, p. 634.

<sup>3</sup> La Clinique Ophthalmologique, vol. xx, p. 145.



attained by always using the same hand, unless one has a natural aptitude for using the left hand. Von Liebermann<sup>1</sup> holds that for exact and highly specialized manipulations, natural aptitude for using one hand is of very little importance; but that training is essential. He points to the training of both hands by the pianist, and the more accurate delicate movements required of the left hand by the violinist. Training the two hands equally, he has found no greater difficulty in using the cataract knife or the keratome with the one hand than with the other.

### DISEASES OF THE CONJUNCTIVA.

**Squirrel Plague Conjunctivitis.** A case of acute ophthalmia and general sepsis apparently starting from infection of the conjunctiva, is reported by Vail,<sup>2</sup> who brings together considerable evidence that it was a manifestation of the so-called "squirrel plague" in man. The patient was a man, aged twenty-eight years, a meat-cutter in a restaurant, whose history was otherwise negative. The disease arose in November, when large numbers of dead rabbits were being found in the vicinity and exposed for sale in the markets. He presented an eye that had been sore for three days, showed marked redness, swelling of the lids, chemosis, and mucowatery discharge. The preauricular glands on that side were swollen to the size of a cherry, and tender. The everted palpebral conjunctiva showed about ten deep, round, yellow necrotic ulcers, from 1 to 6 mm. in diameter.

The affection was at first suspected to be gonococcal; then Parinaud's conjunctivitis was suspected. The patient became ill, lost weight rapidly, and showed a temperature of 102°. The lymph glands of the neck became enlarged, and several pustules resembling varicella appeared on the left temple and malar region. Acute purulent dacryocystitis occurred. The tear sac was opened and discharged creamy pus. After two weeks the general and local conditions rapidly improved. Wherry and Lamb found that inoculating the conjunctiva of rabbits and guinea-pigs with the bacillus of squirrel-plague produced multiple areas of necrosis like those in the above case, with enlargement of the related lymph glands, followed by septicemia and death.

**Samoaan Conjunctivitis.** This disease first described by Rossiter<sup>3</sup> seems to have been long known in the Samoan group, New Guinea, and various parts of the South Pacific. Rossiter traced it to a micrococcus usually occurring in pairs, often seen as a diplococcus and decolorized by Gram. His observations are closely confirmed by Leber,<sup>4</sup> who names the organism *diplococcus samoensis*. He has proved

<sup>1</sup> *Klinische Monats. f. Augenh.*, February, 1914, vol. lii, p. 269.

<sup>2</sup> *Ophthalmic Record*, October, 1914, vol. xxiii, p. 487.

<sup>3</sup> *United States Naval Bulletin*, vol. ii, No. 4; vol. iii, No. 4.

<sup>4</sup> *Graefe's Archiv f. Ophthalmologie*, vol. lxxxvii, p. 528.

it to be slightly pathogenic to the conjunctiva and cornea of guinea-pigs and other animals. Some observers, according to Ely,<sup>1</sup> have been inclined to regard the disease as trachoma, but it runs a much more acute course, with burning, photophobia, conjunctival swelling, hemorrhages, muco-purulent secretion, cloudy infiltration of the cornea, and ulceration that may perforate. Early treatment with silver salts generally brings a cure. But many untreated cases go on to adherent leucoma, anterior staphyloma or panophthalmitis.

**Herpes of Conjunctiva Simulating Chancre.** Brown<sup>2</sup> reports a case in which a girl, aged thirteen years, was seen with indurated swelling of the upper and lower lids, and edematous conjunctiva. As the swelling subsided, an ulcer was revealed at the lower and outer margin of the cornea, and several apparently ruptured vesicles on both bulbar and palpebral conjunctiva. Lues was suspected, but the Wassermann proved negative, and under local treatment the disease ran its course in about six weeks.

**Trachoma.** The etiology of trachoma was to have been a chief subject for discussion at the International Ophthalmological Congress planned to be held at St. Petersburg in August last. The papers to open the discussion, having been prepared before the outbreak of war, have been published. Axenfeld,<sup>3</sup> approaching the subject from the laboratory side, accepts the contagiousness of trachoma, the filterability of the virus, and its transmissibility to apes. The proofs of racial or climatic predisposition are not convincing; and it is uncertain whether the disease leaves an acquired immunity. The virus shows little resistance to heat, cold, or drying. For eight years the "inclusion bodies" (see former June volumes) have been observed and discussed. Axenfeld thinks they are parasitic, but more clearly connected with ophthalmia neonatorum than with trachoma.

Gallenga and Walter<sup>4</sup> view the subject from their extensive clinical studies of trachoma in Italy and Russia. Gallenga discusses the relation that trachoma bears to other forms of conjunctivitis. He believes it may follow the acute conjunctivitis of the Koch-Weeks bacillus; and that the diplobacillus of Morax and Axenfeld may be responsible for relapses. Changes characteristic of trachoma sometimes follow gonorrheal conjunctivitis; and vernal conjunctivitis and trachoma may exist in the same eye. Walter is convinced that trachoma is not a disease *sui generis*, but a particular variety of reaction of tissue to some stimulation. If this be true, it cannot be truly contagious. It may become so if there is much secretion. But the lymphatic diathesis is a *sine qua non*. Bad hygiene and social conditions favor the spread

<sup>1</sup> Ophthalmic Record, vol. xxiii, p. 433.

<sup>2</sup> American Journal Ophthalmology, May, 1914, vol. xxv, p. 429.

<sup>3</sup> Die Aetiology des Trachoms, Jena, G. Fischer.

<sup>4</sup> Ophthalmic Review, January, 1915, vol. xxxiv, p. 17.

of trachoma. It must be admitted that as yet no theory of etiology explains all the facts observed with reference to trachoma.

After recent investigations have been given their full weight, the measures proper for combating trachoma remain the same. In the treatment of trachoma, Dewey<sup>1</sup> uses expression of the granules, supplemented by an olive shaped burr, which he uses to ream out the granules that escape the forceps. This is generally done under local anesthesia. The need for further evidence regarding carbon dioxide snow, referred to last year,<sup>2</sup> has been partly met by Harston<sup>3</sup> who has used it more than three years and in over 7000 cases. He claims that, used in connection with other treatment, it is the most rapid method of cure. With it, the chronic cases are cured in three months, and the acute cases in six months. It causes less pain than copper sulphate crystal. The crayon is held against the conjunctiva fifteen seconds the first time, thirty seconds after that, being repeated every ten to fourteen days. Care must be taken not to touch the cornea with the snow or with the frozen lid.

**Conjunctivitis in Infants.** Meyerhof<sup>4</sup> for ten years kept notes of all cases of conjunctivitis occurring during the first year of life. In the first month he met 11 cases of *gonococcus conjunctivitis*. After this, these cases numbered from twelve to fourteen each month, until the twelfth when there were 20, with a total for the year of 161. These observations were made in Cairo, Egypt, where there is much reason to believe that gonorrheal conjunctivitis is spread among children by flies,<sup>5</sup> and in other methods, so that the above figures are very different from what would be obtained in other cities. With reference to other forms of conjunctivitis, probably Cairo is not so different from other places.

He found that in the first month there were 7 cases of *acute contagious* (Koch-Weeks) *conjunctivitis*; and these cases increased rather steadily to 132 in the twelfth—a total of 469. *Diphtheritic conjunctivitis* (Loeffler bacillus) occurred in eight children, of whom six had corneal involvement. These were scattered throughout the year, one in the first month, two in the eleventh. *Trachoma* first appeared in the fourth month, 3 cases, and increased to 18 cases in the last month—total 54. These figures enforce the idea that conjunctivitis in infants is not generally a gonococcus disease, although the gonococcus cases are the most dangerous.

<sup>1</sup> Ophthalmic Record, April, 1914, vol. xxiii, p. 187.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1914, p. 429.

<sup>3</sup> Ophthalmoscope, November, 1914, vol. xii, p. 654.

<sup>4</sup> Klin. Monatsblätter f. Augenheilkunde, September, 1914, p. 334.

<sup>5</sup> PROGRESSIVE MEDICINE, June, 1910, p. 330.



## CORNEA AND SCLERA.

**Serpent Ulcer.** The specific effects of quinin derivatives, especially ethylhydrocuprein, were described last year.<sup>1</sup> The hope of finding in it a reliable remedy for pneumococcus infection of the cornea has been fully justified by the reported experience of many observers. Schur<sup>2</sup> reports an experience with 28 cases, of which 7 were severe, and 16 moderately severe. In all that were not far advanced before treatment was begun, a good recovery was secured. Kummell<sup>3</sup> reports 17 cases, obtaining a cure with little scarring in all. The average duration was twenty days. Lystad<sup>4</sup> calls attention to the value of the drug in clearing the conjunctiva of the pneumococcus prior to operations on the eyeball; or, in cases of slight injury, before the cornea has become infected. The drug is placed on the market under the name *optochin*, the hydrochlorid to be used in 1 or 2 per cent. watery solution, and the basic optochin for use in ointment. Solutions should be not over three weeks old, and kept in brown glass.

**Neuropathic Keratitis.** The corneal lesions produced by division of the root of the fifth nerve, and the similar changes following lesions involving this nerve have long been known. Yet their exact pathology has continued to be a subject for debate. Some light has been thrown on it by Sgrosso,<sup>5</sup> who has experimented on guinea-pigs. With the early changes in the cornea, breaking down of the epithelium at the centre, and incipient necrosis of the true corneal substance, he always found lesions of the ciliary body. The processes were swollen and distorted. Later, when the destruction at the centre of the cornea had caused a superficial ulcer, and the true corneal tissue had become infiltrated and vascular, the ciliary processes showed a slow progressive atrophy, were shrunken and incompletely covered with epithelium. In one animal he saw the corneal lesions almost completely repaired, but the ciliary body continued to show the progressive atrophy. He believes the corneal changes that have heretofore attracted most attention, are only incidental to more complex alterations of the highly vascular tissues of the eyeball, which affect the nutrition of the whole eye.

**Keratomycosis.** The different varieties of mold seem to have little or no power of invading the healthy cornea. But they are so widely diffused that they are liable to gain access to the corneal tissue through many slight injuries, and in some cases are distinctly pathogenic. Cavara<sup>6</sup> reports a case in which the eye was struck with a clod of earth,

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1914, p. 429.

<sup>2</sup> Klin. Monatsblätter f. Augenheilkunde, September, 1914, vol. liii, p. 432.

<sup>3</sup> Münch. med. Woch., vol. lxi, p. 1326.

<sup>4</sup> Ophthalmic Literature, February, 1914, vol. iv, p. 31.

<sup>5</sup> Arch. di Ottalmologia, vol. xxi, pp. 241, 281.

<sup>6</sup> Ann. di Ottalmologia, vol. xlii, p. 650.

giving rise to two opaque, white, raised areas, toward each of which bloodvessels extended from the limbus. He obtained from these lesions an interlacing mycelium of white or gray color, which proved pathogenic for the rabbit and guinea-pig. This plant he named *Mucorinea Cornualis*. Experiment with other species of mucors seemed to show that they were not pathogenic. But this might not be true with regard to man. Orlow<sup>1</sup> reports 3 cases of keratomycesis following corneal injury from the dust of hay, and a wheat kernel. In one of these, hypopyon developed.

**Parenchymatous Keratitis.** The importance of syphilis in causing this condition was formerly doubted in Germany, but is now proven by overwhelming evidence. Lesser and Carsten<sup>2</sup> report the results of examination of 36 families, in which occurred 38 cases of parenchymatous keratitis. Of these cases, 35 gave positive Wassermann reaction; and of the other 3, 2 gave the luetin cutaneous reaction. Only 5 cases gave a positive von Pirquet. Thirty of the fathers were examined, 21 giving evidence of syphilitic infection. Of these, 4 had tabes, and 1 paresis. Of 31 mothers, 23 gave positive Wassermann reactions, although only 4 could give any history of syphilis.

Igersheimer<sup>3</sup> still holds that the corneal changes are due to the presence of the spirochete in the cornea, although the spirochete products from other parts of the body may aid in the development of the corneal lesion. Lesser and Carsten attribute the corneal changes to disturbance of nutrition arising from alterations in the bloodvessels. The value of salvarsan in the treatment of this condition is still unsettled. Hillion<sup>4</sup> finds that the drug is beneficial, but sometimes not until after a second or third dose.

Discussing the form of keratitis formerly known as scrofulous, Schieck<sup>5</sup> argues that it is anaphylactic in nature. Thus, it may arise from tubercle toxins, latent syphilis, or other causes. Trauma might be an exciting cause. This view is based chiefly from the observation of experimental parenchymatous keratitis in rabbits.

In two cases of corneal tuberculosis reported by Laserew,<sup>6</sup> the Wassermann reaction was negative and the von Pirquet positive. Guaiacol was used locally in 5 per cent., salve, twice daily; and 1 per cent. watery solution for subconjunctival injection every two or three days. Complete cures were obtained with vision of 0.1 and 0.8.

**Corneal Staphyloma.** **Sclero-corneal Trephining** has been tried by Reinhold<sup>7</sup> for extensive anterior staphyloma. He reports 17 cases,

<sup>1</sup> Klin. Monatsblätter f. Augenheilkunde, February, 1914, vol. lii, p. 326.

<sup>2</sup> Deutsch med. Woch., vol. xl, p. 755.

<sup>3</sup> Thirty-ninth Ophthalmologic Congress, Heidelberg, p. 25.

<sup>4</sup> Société d'Ophthalmologie d'Paris, February 3, 1914; Clin. Ophtalmologique, vol. xx, p. 201.

<sup>5</sup> Zeit. f. Augenh., August, 1914, vol. xxxii, p. 95.

<sup>6</sup> Klin. Monatsblätter f. Augenh., June, 1914, vol. lii, p. 894.

<sup>7</sup> Ophthalmic Review, September, 1914, vol. xxxiii, p. 285.

of which 11 were improved, 6 showing considerable improvement in vision. The trephine used should be 3 mm. in diameter, the hole placed principally in the cornea. An iridectomy was done in all cases. The operation is contraindicated where there is reason to suspect that the lens has been dislocated forward, where it may come in contact with the trephine opening.

**Conical Cornea.** Many cases of keratoconus do not require operation, but, when vision cannot be brought up to one-fourth of normal, and especially if the bulging of the cornea seems to be progressive, operation is justified. The most popular method of operating in the past has been with the electro-cautery. Adams<sup>1</sup> combines with this sclero-corneal trephining. He reports eight cases in which, immediately after using the cautery, the trephining was done. By this combination the scar tissue produced by the cautery is allowed to consolidate and flatten down under the favorable circumstances of diminished intra-ocular tension.

#### ANTERIOR CHAMBER, PUPIL, AND UVEAL TRACT.

**Pupil Reactions.** Loss of pupil reaction to light in one eye is usually accepted as confirming a claim of blindness in that eye. But Lohmann<sup>2</sup> reports a case showing that absence of the light reflex may coexist with full vision. His patient had vision of 1 in the right eye, and in the left 0.9, in spite of an unusually extensive persistent hyaloid artery. In weak illumination of either eye, both pupils were 7.5 mm. Strong illumination of the left eye caused both pupils to contract to 4 mm. But with strong illumination of the right eye, both pupils remain dilated to 7.5 mm. It was only when a very powerful light, 2600 meter candles, was placed close to the eye that direct illumination of the right eye caused the pupil to contract to 6.5 mm. It was not a loss of light reaction, Argyll-Robertson symptom, but failure of light falling on the right eye to set up any such reaction. When light fell on the left eye, the reaction occurred in both.

So-called MYOTONIC REACTIONS OF THE PUPIL have usually been observed in response to light. But two cases are reported by Oloff<sup>3</sup> in which there was also a very slow contraction of the pupil with convergence. In each case the pupil presenting the slow reactions was habitually larger than its fellow. In one case there was complete loss of the knee-jerks. Coats<sup>4</sup> reports a case in which, along with partial

<sup>1</sup> Ophthalmoscope, March, 1914, vol. xii, p. 132.

<sup>2</sup> Archiv f. Augenheilkunde, vol. lxxvii, p. 43.

<sup>3</sup> Klinische Monatsblätter f. Augenheilkunde, October-December, 1914, vol. liii, p. 493.

<sup>4</sup> Ophthalmological Society of United Kingdom, vol. xxxiv, p. 202.



oculo-motor paralysis, there was *cyclic contraction and dilatation* of the pupil. The pupil would contract to 3 mm., or less, rather quickly, within five seconds, as a rule; remain so a variable time, a minute or so, then slowly dilate to 6 or 7 mm., and, after a variable time, contract again. Attempts at convergence tended to produce contraction, while abduction of the eye tended toward dilatation. But, if the eye were kept turned some length of time, the cycle of contraction and dilatation was resumed. When dilated, the pupil reacted to light thrown in either eye, but not when contracted. These irregular reactions of the pupil probably all point to lowered efficiency in the mechanism of pupil reactions, due either to congenital deficiency, or to previous disease followed by partial recovery. They have practical importance also through a tendency to confuse the inferences drawn with reference to the more common reactions.

**Pigmentation of the Iris.** In the general knowledge of the subject Harman<sup>1</sup> points that there is a wide gap between the uniform slaty-blue color, known to be always present at birth, and the wide variations exhibited in later years. He has tried to fill the gap by observations made on four children; at first every week until the age of six months, and then at intervals of a month. The father of these children had blue eyes and light hair; the mother, dark brown eyes and hair. Close examination of the iris at birth showed that with the slaty-blue color it exhibited a smooth, indistinct texture, as though the proper iris tissue were covered by a muddy deposit. The first change noted was the clearing up of this deposit, rendering the iris stroma more distinct. This clearing up began as early as the third to the sixth week. Brown pigment was noted on the surface of the iris as early as the sixth week. It appeared in patches, first in the basal (peripheral) zone, and earlier and more advanced in the temporal half of the iris. In blue irides, a later pigmentation may appear at the pupillary border. This may be during the second year or later, and results in the dirty blue, or greenish iris.

**Anomalies of the Iris.** A case reported by Bergmeister<sup>2</sup> illustrates an unusual cause for dark spots in the iris. A girl, aged eight years, with a light brown iris showed, at the upper, nasal margin of the pupil, a blackish-brown spot, which was due to absence of the anterior and vascular layers of the iris. It was a superficial or incomplete coloboma revealing the darker posterior layer.

Wiegmann<sup>3</sup> reports a case in which the anterior layer was absent from the central part of the iris in both eyes. Toward the periphery it was represented by a coarse net-work very loosely attached to the posterior layer, which seemed normal. The pupil reactions were

<sup>1</sup> Ophthalmological Society of United Kingdom, vol. xxxiv, p. 137.

<sup>2</sup> Cent. f. p. Augenheilkunde, April, 1914, vol. xxxviii, p. 100.

Klinische Monatsblätter f. Augenheilkunde, December, 1913, vol. li, p. 697.

normal, but the anterior tissue took no part in them, and with the pupil widely dilated the net-work hung in front of the pupil.

**Causes of Uveitis.** Cases of iritis treated by the general practitioner with atropin and possibly leeches, without any attempt to discover the underlying constitutional cause, are the subject for cynical comment on the part of the oculist. In almost all inflammations of the uveal tract there is a constitutional cause, and if one had to choose between local and general treatment it would, on the whole, be better to keep the latter. Every case of uveitis ought to raise the question: What is the causative general disease? Although some are far more important than others the list of such causes is a long one.

Jellett<sup>1</sup> reports a case of *iridocyclitis due to trypanosomiasis*. The patient had lived in tropical Africa, returning to England for attacks of fever. His health had improved; but the occurrence of the uveal inflammation a year later, and the exclusion of other causes for it, led to a third examination of the blood in which the trypanosomes were first discovered. Inman<sup>2</sup> also reports a case of iridocyclitis in a boy who had been living in Northern Nigeria, and was known to be suffering from trypanosomiasis. The Wassermann reaction was positive, but this is a symptom of this disease.

Croftan<sup>3</sup> reports 3 cases of *gouty iritis*. Two had been treated, without benefit, as tuberculous and rheumatic. All recovered on a diet free from purin bodies, with large doses of atophan. Beaumont<sup>4</sup> points out that with the "passing" of rheumatism, *rheumatic iritis* naturally disappeared. (See PROGRESSIVE MEDICINE, June, 1914, p. 433.) The cases formerly classed as rheumatic are now seen to be chiefly due to toxemia or systemic gonorrhea. Garcia Mansilla<sup>5</sup> reported a case in which fourteen attacks of acute serous iritis occurred in six years, with a chronic gonorrheal prostatitis.

Schou<sup>6</sup> saw a boy, aged thirteen years, with inflammation and tubercular swelling of the iris, but in whom both the tuberculin and Wassermann reactions were negative. He had a temperature of 38° C. Later he developed swelling of the parotid glands, furnishing an example of the *uveo-parotid fever* described by Heerfordt. Koyanago<sup>7</sup> reports 3 cases of leukemia, one myelogenous and 2 lymphatic, in which there was accumulation of leukocytes in the uveal tract causing, in 1 case, great swelling of the choroid.

<sup>1</sup> Ophthalmic Review, February, 1915, vol. xxxiv, p. 41.

<sup>2</sup> Ibid., March, 1914, vol. xxiii, p. 93.

<sup>3</sup> Ophthalmic Record, March, 1914, vol. xxiii, p. 148.

<sup>4</sup> Ophthalmic Review, January, 1914, vol. xxxiii, p. 30.

<sup>5</sup> Archives de Oftalmologia, vol. xiv, p. 66.

<sup>6</sup> Klinische Monatsblätter f. Augenheilkunde, February, 1914, vol. lii, p. 281.

<sup>7</sup> Ibid., July-August, 1914, vol. liii, p. 152.



**Uveal Tuberculosis.** The importance of intra-ocular tuberculosis, and the number of patients who suffer from it, are only beginning to be appreciated. The fact that these patients usually seem to be in fair general health has often prevented a careful search for this cause of uveal disease. Now that this fact is understood a diagnostic injection of old tuberculin ranks as one of the most important methods of determining the nature of uveal disease. The negative von Pirquet reaction has been supposed to be reliable. But this does not hold for intra-ocular tuberculosis, where a negative von Pirquet may be followed by a rise of temperature and local reaction from the diagnostic tuberculin injection. Such evidence would, of course, lead to therapeutic tuberculin injections. Fuchs<sup>1</sup> reports favorable results with different forms of tuberculous uveitis, under a series of injections of old tuberculin. But he also holds that attention to the diet and general manner of life are very important. In addition, local treatment may be needed, such as atropin, heat, dionin, and sometimes operation for synechia. In discussing Fuchs' paper, several confirmed his experience, but Wagenmann pointed out that for the long recognized forms of uveal tuberculosis, especially for the progressive solitary tubercular mass, enucleation of the eyeball should be practiced to prevent extra-ocular extension of the disease.

**Sympathetic Ophthalmia.** A large amount of experimental work and writing have been devoted to the anaphylactic theory of sympathetic ophthalmia.<sup>2</sup> In an extended and elaborate review of the subject, Gifford<sup>3</sup> points out that anaphylaxis fails to explain why this disease is almost unknown, except after perforating wound of the exciting eye; and that the manner of onset, insidious, with gradually increasing malignity, is the opposite of the explosion that would be expected from anaphylaxis. Anaphylaxis produced by changes in uveal pigment throws no light on sympathetic disease beginning with optic neuritis; or sympathetic optic atrophy. But he thinks the anatomic picture of fully developed sympathetic ophthalmitis is so exactly that of an infectious granuloma, as to constitute the strongest argument against anything but a microbial origin of the disease. He suggests that it is not necessary to assume that the germ passes from one eye to the other always by the same channel. It is even quite conceivable that the specific germs may reach the exciting eye by some channel other than a penetrating wound.

In his second communication, Gifford reports striking benefit in the treatment of sympathetic uveitis with *atophan*. His results have, on the whole, been superior to those obtained by salicylates, a method of treatment which he originated, and which is now widely used. He

<sup>1</sup> Klinische Monatsblätter f. Augenheilkunde, January, 1914, vol. lii, p. 134.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1913, p. 422.

<sup>3</sup> Ophthalmic Record, February and July, 1914, vol. xxiii, pp. 64, 349.



reports 4 cases, in all of which the salicylates had previously been tried. In all, the results were good. The dose necessary to produce the best results is considerably larger than is commonly recommended. He has given more than a grain a day for each pound of body weight; 210 grains to a man weighing 170 pounds. This was given half by the mouth and half by the rectum. The patient is kept in bed, at least during the latter half of the day, and "given 2 drams of brandy with each of the last three thirty-grain doses." Also a glass of water is given before and after each dose by the mouth.

**Glaucoma.** Surgery has been characterized as the despair of medicine, and in no other direction does this seem more significant than in the treatment of glaucoma. The number of remedies proposed for a certain condition is the best proof of their general inefficiency. This, too, applies to operations for glaucoma. These operations are important, they are valuable; each of them has saved useful vision, or prevented suffering for some patients. But they are not done with the same certain confidence of the result as is a cataract extraction. In spite of the great volume of literature relating to operations, the real hope, with reference to glaucoma, lies in unravelling the mysteries of its causation.

**INTRA-OCULAR TENSION.** Some real light is thrown on the factors which regulate intra-ocular tension by a series of experiments by Hertel.<sup>1</sup> He introduced into the circulation of the rabbit crystalloids like grape sugar, sodium chlorid, and numerous other salts; and also colloids, like gelatin, albumin, and serums. Sometimes these were introduced through the alimentary canal, but the results were more striking when they were thrown directly into a vein. The injection of a strong solution (sodium chlorid, 10 per cent.) was followed by great softening of the eyeball. The eyes became so soft that the tension could not be taken with the tonometer. As the strength of the solution was reduced, the softening it caused grew less. When large amounts of a 0.7 per cent. of sodium chlorid solution were used, a rise of tension occurred. Similarly, strong solutions of other salts, or of albumin, or gelatin, caused diminished tension. Weaker solutions caused less increase, until below a certain strength a rise was produced.

Hertel believes he has demonstrated thus, that the osmotic pressure of the blood is an important factor in determining the intra-ocular tension. Roemer<sup>2</sup> has found that a few cubic centimeters of comma bacillus serum, produces, in rabbits, a prolonged hypotonus. Being isotonic with the normal rabbit serum, it cannot do this by change of osmotic pressure. In the discussion of Roemer's observations, Heine stated, that, in a case of glaucoma, the taking of 20 grams of sodium chlorid by the mouth had reduced the tension for some hours. Active

<sup>1</sup> Graefe's Archiv f. Ophthalmologie, vol. lxxxviii, p. 197.

<sup>2</sup> Klinische Monatsblätter f. Augenheilkunde, December, 1913, vol. li, p. 765.

purgatives have been known to reduce intra-ocular tension, possibly by reduction of the fluid element of the blood.

**SCLERO-CORNEAL TREPHINING.** This operation, perfected by Elliot, continues to be done more widely than any other operation for glaucoma; and material has rapidly accumulated on which the sphere and usefulness of the operation may be determined. Parker<sup>1</sup> has collected the later results of 100 cases operated on by Col. Elliot during his visit to America. He finds that in 61 cases of simple glaucoma the results were good in 83.6 per cent. In acute inflammatory glaucoma they were good in 85.7 per cent. For secondary glaucoma, 80 per cent., and hemorrhagic glaucoma, 50 per cent. Parker's own results in 27 cases were good in 16 cases, and poor in 5; while 6 are set down as failures. He concludes that the average results are better in non-inflammatory glaucoma than in other forms. They were also better when a complete iridectomy were done.

Gifford,<sup>2</sup> in reporting a case of the most serious sequel of trephining,—*late infection*, concludes that all operations which establish a subconjunctival fistula are liable to this complication. This is not sufficient reason for discarding such operations; but it raises the question whether their use is justifiable in all forms of glaucoma, especially in acute glaucoma where iridectomy gives such good results. He also believes that it is an operation liable to set up sympathetic ophthalmia.

### THE CRYSTALLINE LENS.

**Prognosis of Incipient Cataract.** It is pointed out by Jessop<sup>3</sup> that "for centuries the term cataract has been associated with progressive blindness." If certain cases of lens opacity show no tendency to run such a course, the word cataract, with its ordinary implications, should not be used in connection with them. Or, if it be used, it should be so explained as to convey the totally different meaning, in which alone such use is justified. He cites from his records 50 cases, watched for periods of more than four years, in which there was no increase of the lens opacity. In three of these the vision had somewhat deteriorated, not from any increase in the cataract, but from senile changes at the macula. In 2 cases reduced vision was due to tobacco amblyopia; in another case to chronic glaucoma. The case longest under observation, thirty years, still retained his vision of  $\frac{6}{12}$ .

This class of cases is characterized by thin, fine striæ of opacity in the cortex of the lens near the periphery, where they may be quite hidden by the iris. They sometimes form a ring, which has been called the *arcus senilis* of the lens. Such cases furnish the material for the "fake"

<sup>1</sup> Section on Ophthalmology, American Medical Association, 1914, p. 122.

<sup>2</sup> Ophthalmic Record, January, 1914, vol. xxiii, p. 1.

<sup>3</sup> Transactions of Ophthalmological Society of United Kingdom, vol. xxxiv, p. 151.

cures of cataract. Having been once told they had cataract people will pay large amounts for electric massage, or absorption treatment; and then, not going blind, are prepared to certify that the treatment has cured them. Any oculist of considerable experience has met many cases of the kind, and in the discussion of Jessop's paper some very interesting experiences were brought out. Sir Anderson Critchett told of a wealthy clergyman, informed that he had cataract of this kind at the age of forty-eight, who insisted on coming every six months to be reassured with regard to it; and when last seen, at the age of eighty-six, he retained practically the same full vision as at his first visit. Mr. Paton had seen an Australian who was told in 1878 to come back for operation in two years. But who returned in 1904 with vision still  $\frac{6}{9}$  in each eye. Dr. Mackay told of a famous professor, who had been informed a cataract operation would be necessary in a few months, but who got along very well without it to the end of his life, twenty years later. Perhaps, in view of the varied meanings attached to the word cataract, and the complications liable to arise in such a case, it would be best to explain the condition to the patient, or to his family, without using the word; and then to warn them that some one else might call it a cataract; but that calling it a cataract would not alter its essential character, or the prognosis.

**Causes of Cataract.** Although the common form of cataract is often called senile, and opacities may be found in the lens in four out of every five persons who live to be eighty years of age; that some live for many years in poor health or with other marked evidences of senility, and still keep the crystalline lens clear; proves that other factors than age exist, and are of great practical importance. Of late years much has been written of the effect of the *ultra-violet radiations* upon the nutrition of the lens. Burge<sup>1</sup> has experimented in this direction. He used the radiations from a quartz mercury-vapor lamp, sufficiently intense to coagulate egg albumen, or globulin, or serum albumin or globulin, within one hour. But the protein of the normal crystalline lens, or of the vitreous or aqueous humor retained its transparency after one hundred hours of such exposure.

However, by adding to the lens protein solutions of calcium or magnesium chlorid, sodium silicate, or dextrose, too weak to effect its transparency, the ultra-violet radiations were found to cause precipitation and opacity. Analyses of a large number of cataractous lenses show that they contain an abnormal amount of calcium, magnesium and, in India, silicates. Possibly their accumulation in the lens substance with exposure to the ultra-violet radiations from the sun or artificial sources of light, may together cause cataract. This action of dextrose would explain the liability to cataract in diabetes.

<sup>1</sup> American Journal of Physiology, vol. xxxvi, p. 1.



Colonel Smith<sup>1</sup> has pointed out that in India the area of prevalence of cataract is approximately the area of prevalence of stone in the bladder; and that in this area the staple food is wheat, not rice, as in other parts of India. From his application of *Abderhalden's methods* to the study of cataract in 28 cases, von Hippel<sup>2</sup> found the negative reactions were the rule, and reached the conclusion that this method of investigation will not at present help to solve the problems of the causation of cataract.

**Cataract Operations.** Shall the lens be extracted in its capsule, or shall the capsule be left in the eye? This is the question regarding cataract that still is the subject for widest discussion. The latter has been the usual operation, and is still the choice of most operators. The method of Col. Henry Smith for expelling the lens in the capsule has previously been mentioned.<sup>3</sup> His clinic at Amritsar, India, is visited by ophthalmic surgeons from all parts of the world who desire to learn this operation. In the last year, Green<sup>4</sup> and Fisher<sup>5</sup> have reported their experiences in this pilgrimage, and urge the more general adoption of Smith's operation.

For several years Stanculeanu and his assistants at Bucharest have followed the plan of seizing the anterior capsule with a special form of capsule forceps, rocking the lens back and forth until the suspensory ligament has been broken loose, and then extracting the lens in its capsule. Hansell,<sup>6</sup> who visited the Bucharest Clinic to study the operation, concludes that it is to be recommended in uncomplicated senile cataracts, mature or immature. But it is not adapted to the extraction of hypermature cataracts.

A very similar operation has been done by Knapp,<sup>7</sup> who reports a series of 94 cases, in which there was prolapse of the vitreous in 15, but considerable loss of it in only one. Full vision was secured in 22, and almost normal vision in 8 more eyes. In 55 more, vision of  $\frac{20}{70}$ , or over, was gained. He uses the capsule forceps of Kalt. Usually the ligament first gives way below, and remains attached above until the lens has been expelled. The lens is not drawn out with the forceps, but when it has been loosened so that the edge appears in the pupil the forceps are withdrawn. Only 40 to 50 per cent. of senile cataracts are suited to this operation.

The arguments by which the advisability of the extraction of the lens in the capsule are supported are generally based on two assumptions:

<sup>1</sup> Ophthalmoscope, September, 1914, vol. xii, p. 546.

<sup>2</sup> Graefe's Archiv f. Ophthalmologie, vol. lxxxvii, p. 563.

<sup>3</sup> PROGRESSIVE MEDICINE, June, 1910, p. 339; June, 1912, p. 393; June, 1913, p. 437.

<sup>4</sup> Ophthalmology, January, 1915, vol. xi, p. 303.

<sup>5</sup> Ibid., April, 1914, vol. x, p. 429.

<sup>6</sup> Pennsylvania Medical Journal, December, 1914, vol. xvii, p. 171.

<sup>7</sup> Transactions of American Ophthalmological Society, vol. xiii, p. 666.

One, that the retained capsule is very likely to prevent the best vision, and necessitate difficult and dangerous after-operations. The other, that extraction of the lens in the capsule is the only way of avoiding prolonged waiting for the cataract to become mature. Most operators believe that these objections to the old plan have been unduly emphasized by the advocates of the intracapsular operation, which certainly requires a more extended incision in the eyeball, and more mechanical disturbance at the time of the operation, to secure the extrusion of the lens.

Maddox,<sup>1</sup> in discussing the choice of a cataract operation, considers the different procedures with reference to (1) safety; (2) vision obtained; (3) beauty of the eye after operation; (4) brevity of procedure; and (5) fewness of operative interferences. For safety, he places first preliminary iridectomy; and next simple extraction, in suitable cases, with a conjunctival flap. For beauty, simple extraction comes first. For brevity of operation, the preliminary iridectomy; and, for fewness of operative interferences, the combined extraction, with simple extraction second. His preliminary iridectomy is made through a very small incision, an opening as small as 2 mm. externally, widening inward, will serve the purpose. He emphasizes the advantage of the conjunctival flap, which, in favorable cases, he would suture. But, still better, he holds the conjunctival bridge of Desmarres, the flap not being cut free at the upper extremity. During the delivery of the lens the flap can be seized and held aside with forceps, which serve then for the fixation of the eye.

In Story's<sup>2</sup> collective investigation, he found, of 118 operators, that 104 now use some form of *conjunctival flap*, which practice he favors. On the other hand, less than half of the operators ever used a *face mask* during operation. This is a precaution Story thinks important; because the operator's mouth is usually over the seat of operation, and he frequently has to speak to direct the patient. The face mask, however, usually composed of flimsy gauze, may do more to promote a false sense of security, than to prevent infection. It is the operator's eyes, and not his mouth that should be immediately over the seat of operation. Breathing through the nose the expired air is directed still farther from the open wound; and if not beguiled by misplaced confidence in his mask, the operator will be more careful to turn the mouth away when speaking.

Fergus<sup>3</sup> has always looked at a cataract operation as an interesting experiment in asepsis. For twenty-five years he has had every operation preceded by a careful bacteriologic examination; and in that time has not lost a single eye by panophthalmitis. With this experience he can-

<sup>1</sup> Ophthalmic Review, October, 1914, vol. xxxiii, p. 289.

<sup>2</sup> Ibid., December, 1914, vol. xxxiii, p. 356.

<sup>3</sup> Ibid., September, 1914, vol. xxxiii, p. 257.

not understand why anyone should use what are called "test-dressings," which simply foment the eye with its own septic secretions, but give no exact information with regard to the organisms present. We do not know how often this practice is followed, but it is taught in books that are still regarded as authoritative. Fergus finds that the prevention of sepsis avoids many of the after-complications. Thus there is no chance of a tough capsule. Any secondary cataract that may arise will yield to a discission; and there is no sufficient reason for the extraction of the capsule with the lens.

**INFECTION OF THE VITREOUS.** Budek<sup>1</sup> reports a case of blastomycetic infection of the vitreous, following puncture for subretinal fluid and the injection of salt solution into the vitreous. The germs were evidently introduced with the needle. They multiplied in the vitreous, but, when the eye was eviscerated, it was demonstrated that the anterior chamber still remained free from them.

Salus,<sup>2</sup> from an experimental study of the infection and immunity of the vitreous, divides the germs into three groups: The first, of which the sarcinæ are the type, when inoculated into the vitreous, at first shows a diminution, then an increase; but in two or three days they are destroyed. In the second group, of which the bacillus subtilis is typical, there is first an increase in the germs, which may set up a panophthalmitis, then they rapidly die, being exterminated in a few days. The more malignant invaders, like the streptococcus, first diminish slightly in amount, then increase rapidly, and are very slowly and incompletely destroyed by the reaction of the tissues.

### RETINA, OPTIC NERVE, AND VISUAL TRACTS.

**Retinal Vascular Disease.** Cases of *recurring hemorrhage into the vitreous* and of *extensive exudates* into the retina and vitreous have been among the most grave and hopeless diseases affecting the eye in early life. These lesions have often been found in persons of fair general health, and their etiology is extremely obscure. Not rarely such eyes have been removed, since they were blind and there was a possible suspicion of their containing tumors. On microscopic examination some have shown alterations in the walls of the vessels, but in many of the earlier cases these have not been noticed. In the last few years some of these patients have been found to give a positive reaction to old *tuberculin*; and, in several cases, tuberculin treatment has been followed by arrest of the disease, and relative recovery.

Gilbert<sup>3</sup> reports three cases, in all of which the tuberculin reaction was positive and the Wassermann reaction negative. The eyes were

<sup>1</sup> Klinische Monatsblätter f. Augenheilkunde, June, 1914, vol. lli, p. 924.

<sup>2</sup> Graefe's Archiv f. Ophthalmologie, vol. lxxxviii, p. 473.

<sup>3</sup> Heidelberg Ophthalmological Congress, 1913, p. 47.



enucleated and marked microscopical changes in the vessels were found, including thickening and hyaline degeneration of the vessels in the iris, with phlebitis and periphlebitis of the retinal veins. Harms<sup>1</sup> reports a case of juvenile periphlebitis, in which the retinal veins, seen with the ophthalmoscope, were large, tortuous, and ensheathed with gray exudate. Rounded yellow areas were present and small hemorrhages. The conditions increased for a time, then gradually subsided, but the lesions were evident after three years. The patient appeared to be in fair health, but slight exertion produced tachycardia. The tuberculin reaction was weakly positive; the Wassermann, negative. None of these cases appear to have been subjected to the therapeutic test.

The importance of the ocular evidences of *angiosclerosis* is urged by Kress.<sup>2</sup> He points out that this is a disease that cannot be safely permitted to go on to its terminal or frank stages; the changes in the retinal vessels permit a comparatively early diagnosis. As most patients after forty have occasion to seek the services of an oculist, careful examination of the eye-ground at this period may give important data when other clinical symptoms are lacking. By such early recognition we may be in a position to prolong the life of a considerable number of our patients.

An extreme case of *vascular sclerosis* of the retina is reported by Zentmayer.<sup>3</sup> A man, aged thirty years, had reached the last stages of chronic interstitial nephritis. He presented, in his right eye, every one of the retinal vessels converted into dead white ribbons, tapering toward the periphery of the fundus. Only the main branches were visible; the arteries indistinguishable from the veins; and in only two could a hair-line of red be traced on the surface of the optic disk. The other eye presented the typical appearance of albuminuric neuroretinitis. The patient died within two weeks. These vascular changes in the retina are of importance, in that they suggest that similar alterations probably occur at the same time in many other organs of the body.

**Detachment of the Retina.** The simple displacement of the retina from one of its important sources of nutritive supply, the capillaries of the choroid, greatly impairs its function. But, as numerous cases of recovery, spontaneous or under treatment, have demonstrated, it still remains capable of regaining its functional power if brought in proper relation with the vessels on which its activities largely depend. This keeps alive the hope that some reliable and effective treatment will be found for a condition that now largely means practical blindness. This explains the interest that continues to attach to the treatment of this condition in spite of discouraging experiences, such as was noted a year ago.<sup>4</sup>

<sup>1</sup> Graefe's Archiv f. Ophthalmologie, vol. lxxxvii, p. 457.

<sup>2</sup> Ophthalmoscope, December, 1914, vol. xii, p. 700.

<sup>3</sup> Annals of Ophthalmology, January, 1915, vol. xxiv, p. 65.

<sup>4</sup> PROGRESSIVE MEDICINE, June, 1914, p. 445.

Müller<sup>1</sup> reports the results in all the cases that he has been able to follow for two years or more on which he has done his operation. These cases number 24, and of them he states 10 have been entirely cured. His operation consists in taking out a piece of the sclera, thus diminishing the size of the outer coat of the eyeball, to fit the relatively small vitreous body. In the healthy eye the retina is kept in normal relation with the choroid, not by any adhesion existing between them, but by pressure of the vitreous against it. When, by shrinking of the vitreous, or distention of the sclera, as in progressive myopia, the vitreous fails sufficiently to press the retina outward, it very readily becomes detached. To make the outer coats fit the vitreous body, and so leave no room for subretinal fluid is not irrational. But a serious operation that can only be claimed to cure two cases out of five will not speedily become popular. Müller advises that the operation be not tried until other treatment has for one year failed to give relief.

The method used by Birch-Hirschfeld<sup>2</sup> is scarcely less formidable. He passes a hollow needle, which must be extremely sharp, through the coats of the eye; first into the subretinal space, whence he withdraws a portion of the fluid; and thence through the retina into the vitreous, where he injects a slightly greater amount of some fluid isotonic with the humors of the eye. The amount so withdrawn or injected at any one time must be small, he has never made it more than 1.2 c.c. He reports on 30 cases treated in this way, of which all were essentially improved after at least a year, 8 of them being entirely free from detachment; 9 showed little or no benefit, and 10 grew worse. Here, too, the proportion of cases apparently benefited is only 37 per cent. This method also is not to be tried until non-surgical treatment has been tested, and only on certain kinds of cases.

James<sup>3</sup> reports a single case of restoration to useful vision by "non-operative treatment." But even this treatment is rather formidable. The patient, who was previously hopelessly blind in the other eye, remained in bed six weeks with sand bags alongside his head to keep it from moving; and received subconjunctival injections of normal sodium chlorid solution. At the end of that time he was permitted to cautiously begin to move about. He had remained with vision  $\frac{6}{12}$  partly, for two years. The rest-in-bed treatment promises best if begun immediately after the detachment is discovered.

**Toxic Amblyopias.** Next to tobacco, *wood alcohol* causes the largest number of cases of toxic amblyopia, and is far more likely than tobacco to cause complete blindness. From time to time cases have been reported in which blindness followed the inhalation of methyl alcohol vapor. The manufacturers of wood alcohol denied that this was possible,

<sup>1</sup> Deutsch. med. Wochenschrift, vol. xl, No. 26.

<sup>2</sup> Thirty-ninth Ophthalmological Congress, Heidelberg, p. 141.

<sup>3</sup> Ophthalmic Review, January, 1915, vol. xxxiii, p. 3.

at least with the refined "Columbian Spirits," that has been robbed of its offensive odor. Tyson and Schoenberg<sup>1</sup> experimented on dogs, rabbits, and guinea-pigs, and demonstrated that this substance may cause all its toxic effects when inhaled; and that the refined drug is quite toxic as the crude form, and hence is much more dangerous, in that it is likely to be inhaled unconsciously. As the U. S. census shows that nearly two million people are using wood alcohol for industrial purposes, the effort to educate the public as to its danger must be kept up. It is properly made the subject of one of the pamphlets put out by the Council on Health and Public Instruction of the American Medical Association.

*Quinin blindness* is also more common than many physicians realize. Von Speyr<sup>2</sup> reports the case of a woman who took for migraine two coffee-spoonfuls (about 60 grains) of quinin; but soon vomited the second half of it. She quickly became both deaf and blind. Hearing was fully restored. But although central vision rose gradually to almost normal, the field of vision remained so restricted (not over 8 degrees in any direction), that for most purposes she was practically blind.

**Significance of Choked Disk.** The recognition of papilledema with the ophthalmoscope is very often the essential basis of a diagnosis of organic disease of the brain. In the further study of the case, to determine the cause and character of such organic disease, it is of some value to know the relative frequency with which choked disk arises from different causes. Uhthoff's<sup>3</sup> "Bowman Lecture" furnishes interesting statistics from his own experience. He has included only cases that showed a prominence of 1.5 to 2 D. But among them were some that were passing over into neuritic atrophy. This is quite allowable since they have the same diagnostic significance.

He finds brain tumor was the cause in 71 per cent.; cerebral syphilis in 12 per cent.; and tuberculosis in 3.6 per cent. Then come tower skull, brain abscess, and hydrocephalus, each 2.2 per cent. Cysticercus, meningitis and nephritis, each 1.1 per cent.; anemia 0.9 per cent.; sinus thrombosis, 0.6 per cent.; and the following each 0.3 of 1 per cent.: Nephritis in lead poisoning; lead poisoning without nephritis; fracture of the base, and bony cicatrix of the skull; retrobulbar optic disease; and pseudo-choked disk with cerebral symptoms. The diagnosis remained uncertain in 2.2 per cent. The large preponderance of cases due to brain tumor is very striking, especially if we include the tumors arising from syphilis and tuberculosis.

If choked disk is so often due to this cause, what value has absence of optic nerve lesions in excluding cerebral tumor? Uhthoff's table bearing upon this point includes the four conditions, choked disk,

<sup>1</sup> Section on Ophthalmology, American Medical Association, 1914, p. 354.

<sup>2</sup> Klinische Monatsblätter f. Augenheilkunde, September, 1914, p. 393.

<sup>3</sup> Transactions of Ophthalmological Society of United Kingdom, vols. xxiv, xxv.



optic neuritis, neuritic atrophy, and simple atrophy of the optic nerve. He finds that one or the other of these was present in tumor of the cerebrum, in 79 per cent.; tumor of the cerebellum, 88 per cent.; tumor of the pons, 95 per cent.; tumor at the junction of the pons and cerebellum, 90.5 per cent.; tumor of the hypophysis, 38 per cent.; and tumor of the corpora quadrigemina, 40 per cent. Much of the practical value of choked disk as a symptom lies in its bearing on the question of operative interference.

Especial attention has been given to the question of whether the choking is greater or occurs first on the side of the tumor. Uhthoff found it was unilateral in only 4.1 per cent. of his cases. Among these it was ipsilateral in 7, to contralateral in 3.

The unilateral choking of the disk is more common in *cerebral syphilis*. A case of cerebral syphilis with bilateral choked disk watched for thirty-four years afterward is reported by Hirschberg.<sup>1</sup> The patient at thirty-one years presented old syphilis with bone disease, recent papilledema, with vision reduced to  $\frac{1}{3}$  and  $\frac{1}{4}$ . He was placed on inunctions of gray ointment and rapidly recovered. When he was forty-nine he had an abducens paralysis, and again he had mercurial inunctions. At the age of sixty-five, he had normal vision, visual fields and eye-grounds, a slight weakness of the left abducens muscle and otherwise good health. The results of exact diagnosis and vigorous rational treatment are not always to be ascertained over such a long period.

**Hemorrhage Into the Optic Nerve Sheath.** To this is often ascribed blindness following injury to the skull. Dupuy-Dutemps<sup>2</sup> reports 2 cases which came to autopsy. In both the hemorrhage was meningale; in a man aged thirty-four, traumatic, and in a woman, aged forty-seven, spontaneous. In both cases retinal hemorrhages also occurred. In the traumatic case much of the clot was removed by a trephine operation, but the patient died a few hours afterward. There was no fracture of the region of the orbit or optic foramen. The hemorrhage was subdural, but none of it had entered the pial sheath of the nerve. The blood stopped short of the lamina. The retinal hemorrhages were independent of this and of each other, and were due to ruptures of small retinal vessels.

In the second case, three days after, the apoplexy lumbar puncture gave a hemorrhagic liquid. At the end of three weeks each vitreous was found full of blood. The patient died at the end of a month, of a fresh meningeal hemorrhage. The ocular conditions seemed to be the same as in the first case. These give a better basis than has heretofore been obtained for the accepted view with regard to the effects of hemorrhage into the optic nerve sheath.

<sup>1</sup> Centralblätt f. Praktische Augenheilkunde, July, 1914, vol. xxxviii, p. 197.

<sup>2</sup> Annales d'Oculistique, March, 1914, vol. cli, p. 161.

**Optic Neuritis and Myelitis.** In connection with a case that he reports, Goulden<sup>1</sup> publishes an interesting study of what has been known as acute paraplegia associated with bilateral blindness. His patient, a healthy vigorous man, aged sixty, found one day that his sight was getting dim. It failed progressively and on the sixth day he had to be led about. His pupils were then widely dilated, and did not respond to light. The edges of the optic disk were found slightly fluffy. Two days after this he first complained of a peculiar sensation in the feet and legs, and difficulty in moving them; and two days after that was completely paralyzed below the waist. The eye conditions remained unchanged. But he died ten days after he was first seen, sixteen days after he first noticed failure of sight.

Goulden finds that 52 such cases have been recorded, and that in about four-fifths of them the optic neuritis was the first symptom to appear, although in rare cases the neuritis and myelitis appeared simultaneously. Usually one eye is affected first, the other following in a few hours to several weeks; and occasionally the myelitis may begin in the interval. The impairment of vision has preceded the spinal symptoms by as much as two months. If the patient survives as much as two weeks, vision usually begins to return. In this, the lesion of the optic nerve resembles an ordinary retrobulbar neuritis. Goulden accepts the view that the lesions of the optic nerve and spinal cord are produced by a common agent, which acts directly upon the nerve structures; and most likely it is infective.

In the more chronic case reported by Holden<sup>2</sup> the sequence of lesions was reversed. The patient had progressive spinal symptoms for a month, when he entered a hospital. These began to improve three weeks later. And two and one-half months from the first symptoms he was able to walk again. Three months from the beginning his right eye became obscured, and ten days later was completely blind. Ten days after that, the left eye also became affected. Vision was slowly recovered. At the end of a year from the first spinal symptoms it had reached, right  $\frac{2}{7} \frac{0}{0}$ , left  $\frac{2}{3} \frac{0}{0}$ , and was still improving.

### LIDS, LACRIMAL APPARATUS, AND ORBIT.

**Xanthelasma.** The yellowish spots, having somewhat the appearance of wash-leather, that are seen not infrequently on the lids near the inner canthus, are often a matter of concern to their possessors, on account of fear that they may spread and become more disfiguring, or may be the start of malignant disease. While we have been able to reassure patients on these points, our understanding of the exact nature of the patches has heretofore been hazy.

<sup>1</sup> Transactions of Ophthalmological Society of United Kingdom, vol. xxxiv, p. 229.

<sup>2</sup> Archives of Ophthalmology, May, 1914, vol. xliii, p. 231.

Mawas<sup>1</sup> has studied the histology and histochemistry of such lesions. He has examined fresh specimens teased in physiologic serum, fixed specimens, stained by various methods, and by the application of reagents to determine the properties of the lipoids present. Coloring with Sudan III showed that the granules of fat in the xanthelasma cells are not similar to those of the subcutaneous adipose tissue. Study of sections of fixed tissue, showed the mass to be a little tumor, composed of lobules distinct from each other. The cells resemble gland cells, some having several nuclei and a certain resemblance to giant cells. He concludes from the pathologic anatomy, that the xanthelasma lobule resembles an adenoma; and its cells may be compared to those produced in the normal sebaceous glands.

**Palpebral Myiasis.** Occasionally the larvae of various flies have been deposited and developed in and about the eye. Lagleyze<sup>2</sup> reports a case in which, on opening a furunculous tumor of the lid a larva, 16 mm. long by 8 mm. wide, was found in the pus which escaped. Two other similar growths were found to have the same contents. The specimens were identified as the grub of a fly of that region.

**Poliosis Following Injury.** Steindorff<sup>3</sup> reports the case of a woman seen when twenty-five years of age, who, at the age of four or five, had struck her left brow against the corner of a chest without causing bleeding. Shortly after the eyebrow and lashes of the upper and lower lids, for the width of a finger-tip near the centre of the lids, became snow-white, and so continued. The skin of the region presented the changes of vitiligo.

**Lacrimal Obstruction.** It is more than ten years since Toti published his first account of dacryocystorhinostomy, and five years since West demonstrated his window-resection of the nasal duct before the American Ophthalmological Society. Since that time the latter operation has grown in favor with ophthalmologists, who by the older methods found the treatment of dacryocystitis often unsatisfactory; and the rhinologists have welcomed it as an extension of their operative field. Graham and Paton<sup>4</sup> exhibiting two cases before the Ophthalmological Society of the United Kingdom, reported that in five treated in this manner the results had all been satisfactory.

The operation begins with removing a circular piece of mucous membrane from the outer wall of the nose in front of the middle turbinal. Then the membrane is raised in a flap around this opening and the bone chiseled through to the sac. Pushing the wall of the tear sac or duct into the bony opening, by a probe passed through the lower canaliculus, this part of the nasal wall of the sac is cut away. They

<sup>1</sup> *Annales d'Oculistique*, vol. cli, p. 437.

<sup>2</sup> *Boletin de la Sociedad de Oftalmologia Buenos Aires*, vol. i, p. 15.

<sup>3</sup> *Klinische Monatsblätter f. Augenheilkunde*, July-August, 1914, vol. liii, p. 188.

<sup>4</sup> *Transactions of Ophthalmological Society of United Kingdom*, vol. xxxiv, p. 102.



did Halle's modification of the operation, *viz.*, introduced a strand of strong cat-gut, or thin lead wire through the canaliculus and the new passage, and out of the nose, to secure apposition of the parts. In the discussion Clegg expressed the opinion, that, with an infected sac, excision of the sac would be a safer preliminary to cataract extraction. Wray thought the operation a good one, if it opened into the duct. But, if it opened into the sac, and converted it into a part of the nose, it would be fatal from the ophthalmic surgeon's standpoint. Paton replied that with blowing the nose hard, there was no disturbance produced about the eye; and he thought it would be satisfactory for infection. The two cases shown had been regurgitating dirty muco-pus. But a week afterward, syringing brought away only clear fluid.

**A Method of Destroying the Sac** that will appeal more favorably to the general practitioner is described by Gifford.<sup>1</sup> He infiltrates the tissues well down to the sac, with a 1 or 2 per cent. solution of cocain, with a little adrenalin. A vertical incision is then made, about one-fourth of an inch inward from the caruncle, and fully one-fourth of an inch long. He tries to leave the sac distended until this incision is made. The sac is then packed with iodoform gauze, and may be left until the next day to complete the operation. Or, having waited until all bleeding is stopped, carefully dry out the sac with cotton swabs. Have a slender metal applicator wrapped with cotton, to a ball one-eighth inch in diameter, apply zinc ointment over the surrounding skin, and into the incision. Anesthetize with crystals of cocain placed in the sac. Separate the lips of the wound, and drop in the sac two or three drops of liquified (full strength) trichloroacetic acid. Scrub the interior of the cavity thoroughly in every part with the ball swab. Dry out the cavity again, and give it a second scrubbing with the swab dipped in the acid. Dry out again, syringe with a cleansing solution, and fill the cavity with aristol powder. Put zinc ointment on the surrounding skin, and apply a light dressing for a day or two. Gifford has used this method for eight years, and in about 40 cases. He has seen 3 cases in which a slight discharge continued from the canaliculus. It was cured by slitting both canaliculi and using the galvano-cautery in the pocket thus formed. The resulting scar can only be seen by close inspection.

**Death Following Evisceration.** It has been the practice with many surgeons to avoid enucleation of the eyeball in cases of acute panophthalmitis, because that operation has been followed in a few instances by death from meningitis. It has been held to be safer for this condition to do evisceration, or incision of the cornea, which does not open up the lymph channels outside the eyeball. Clegg<sup>2</sup> reports a case in which open evisceration was followed by death from purulent meningitis. The eye had been lost by hypopyon keratitis following injury seven years before, and was suffering from panophthalmitis when the evisceration

<sup>1</sup> Ophthalmic Record, January, 1915, vol. xxiv, p. 22.

<sup>2</sup> Transactions of Ophthalmological Society of United Kingdom, vol. xxxiv, p. 322.

was done. The second day afterward the patient became rambling in speech, and died on the fourth day following the operation. The tissues of the conjunctiva, lids and orbit appeared normal, the cerebral hemispheres were bathed in pus, and, on cutting the optic nerve at the foramen, a bead of pus exuded from the distal cut surface.

### HYGIENE.

**Illumination.** Large financial interests, competing in the furnishing of systems for artificial illumination, have entered upon the study of this subject by the exact methods of electrical engineering. In this way a large amount of important new material is coming into the literature that will be of great value. But this still needs to be carefully worked over and studied from the standpoint of the physiologist and the physician. Some work of this kind has been done by Ferree,<sup>1</sup> who reports the results of comparisons between daylight, and direct, semi-direct and indirect illumination. The comparisons have to include maintenance of efficiency and comfort, as well as visual acuity. The factors that influenced these are, distribution of light in the field of vision, its intensity and its quality.

The distribution or surface brightness he finds of greatest importance. The ideal is to have the field of vision uniformly illuminated, and presenting no extremes. This is best attained by daylight. By daylight of proper intensity the eye loses practically nothing in efficiency, in the course of three or four hours' work. With indirect artificial lighting it loses little more than by daylight. With semi-direct lighting, and still more with direct artificial lighting (unshaded light shining directly on the work), it loses enormously in efficiency in the period mentioned.

The eye can adapt itself to very great differences of intensity of illumination, either by daylight or indirect artificial lighting. With direct lighting, or semi-direct lighting, the best results are attained in a narrow range of illumination, at about 2.2 foot candles at the point of work. This is a considerably lower illumination than has been recommended by illuminating engineers. With the indirect system, 1.16 foot candles at the point of work is sufficient to furnish favorable conditions for continuous work.

**Protective Glasses.** The question of glasses to protect the eye from exposure to ultra-violet radiations, and excessively brilliant light, in industrial processes, has been studied by Luckiesh.<sup>2</sup> To eliminate the ultra-violet rays he chooses a yellow-green glass; and has found that workmen engaged in welding prefer this to any other color. It is also a glass that disturbs least the relative values of the different colors. Where intensity of luminous radiations must also be cut down, this glass was combined with glass of the proper neutral tint.

<sup>1</sup> Ophthalmology, July, 1914, vol. x, p. 622.

<sup>2</sup> Archives of Ophthalmology, July, 1914, vol. xliii, p. 382.

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